JPRS-ELS-87-012

13 MARCH 1987

Europe/Latin America Report

SCIENCE AND TECHNOLOGY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-ELS-87-012

13 MARCH 1987

EUROPE/LATIN AMERICA REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

LATIN AMERICA

/12223

FINNS TO WORK ON SOVIET LIMA-D PROJECT OF MARS-PHOBOS PROBE

Helsinki KANSAN UUTISET in Finnish 31 Oct 86 p 14

[Text] For the second time, Finnish scientists are involved in a project to develop equipment for two Soviet Mars probes.

Finns already are participants in the Aspera Project, dealing with probes, whose equipment will eventually measure solar wind and the electrically charged particles near Mars.

Now the involvement includes the so called Lima-D Project, in which the surface composition of Phobos, a moon of Mars, is studied.

In the Lima-D Project, the moon's surface material will be analyzed using a completely new method: the probe is lowered to within only 50 meters of the surface of the moon; it shoots it with a laser, and then collects and studies the substance condensed in such a way.

Microcomputer

Among other things, the task of the Finns in Lima-D includes building a microcomputer which can be used for testing on the ground prior to the flight. During the transit of Phobos, the microcomputer on the ground station will be connected to the receiver of the messages sent from the probe. Hollming Elektroniikka of Tampere is building a testing system based on the microcomputer.

Over three million markkas, partly from the Academy of Finland and the Technological Development Center, have been invested in Lima-D. The Meteorological Institute will participate in the construction of the measuring device located in the probe itself.

Pioneers

Since this is something our industry has never done before, the Finnish scientists are pioneers in the development of objects flying in space. To date the companies have developed various ground stations, dealing with satellites communication, among other things.

However, the industry is very interested in manufacturing actual space equipment, says Johan Siven, licentiate of philosophy, from the Meteorological Institute and involved in the probe project.

The Mars flight of the Soviet Union is due to take place in the summer of 1988. The Soviet Union will send two successive probes of the Phobos Project on a trip lasting about 200 days. The probe weighs about three tons. Photo: Earlier, Phobos, the innermost moon of Mars, has been photographed by a probe of the Viking series at the distance of approximately 500 km.

12956
CSO: 3698/79

FRG FIRM TO PROVIDE SOFTWARE SYSTEM SCIENTEX TO SOVIETS

Stuttgart DIE COMPUTER ZEITUNG in German 16 Jun 86 p 6

[Article: "Agreement with Academy of Sciences About To Be Concluded: Software for the Soviet Union"]

[Text] Munich (ZI)--A small German software development firm has attempted to meet the powerful American software giants head on--with success. The Midas company has discovered an untapped market. The result: It is supplying software to the Soviet Union. The program, called "ScienTex," has already been translated into Russian. Conclusion of the cooperative agreement is currently being delayed week after week, however, even though the Soviets themselves have said that they have already begun series production of an IBM-compatible PC.

ScienTex is just one of many text processing programs, and yet it is unique. According to Midas, it is the first program which has been translated into Russian and also the first which the Russians want to buy. Beginning in August, the LARS and Multigraf programs are also to be officially offered for sale in the Soviet Union, said Wolfgang Fechner, a Midas employee, at a press conference in Munich. Business with this East Bloc nation would greatly increase Midas' sales, he said, although its scope remained a company secret. The Academy of Sciences committee in Moscow has also not yet signed the agreement even though it was planned weeks ago. Not only in Germany do bureaucracies result in delays.

Midas has only been in existence for three years. Its area of expertise is software development in the scientific and technical fields. In 1985 it had sales of DM 4.2 million. More important than numbers, however, is the fact that the ScienTex text processing program was selected as the 1985 software program of the year. But this alone cannot have been the deciding factor in terms of the deal with the Soviet Union. In addition to the good relations Midas has with Moscow, the presence of the Cyrillic alphabet in ScienTex was probably of greater importance to the Soviet scientists. Moreover, ScienTex can do so much more.

It has all of the usual text processing functions such as copy, delete, block move, boldface, block justification and so on. However, by pressing a key the user can also switch to the Cyrillic or Greek alphabets or to mathematical and

chemical symbols. A total of five character sets are available. In addition, a character set editor allows the user to generate his own characters.

ScienTex runs on all IBM PC's and compatibles and requires 256K RAM. Printers made by Epson, NEC and others can be added, as well as any other printer so long as it has the so-called "character download" feature. The LARS (powerful archiving and research system) data bank, according to Midas, is the fastest information data bank available for a PC. The advantage offered by the program is that LARS finds the key word sought regardless of its subject area classification. And it does it fast--5000 documents or files can be searched within a few seconds. Its disk capacity, at 10 Mbytes, is about 30,000 titles. The new expanded LARS program allows greater flexibility by means of 32 freely definable data banks. Multiple indexing of 40 different data fields is possible, with up to 65,000 documents per data bank. LARS is able to search with variously interlaced "and," "or," and "without" operations, thus facilitating the search. Interval, word root and date queries are also possible. LARS runs on all IBM PC's and compatibles.

Large-scale computers which have up to now handled remote data transmission operations for businesses simply cost much too much and moreover are subjected to very high usage. Therefore, an existing PC with modem can be converted to a data concentrator. The "Data-Express" program allows two computers to exchange data with one another inexpensively and even without the need for an operator.

Data-Express is controlled via function keys and permits both manual and completely automatic transmission. In the manual operating mode telephone numbers can be dialed and data sent or recalled. In the automatic mode a list of telephone numbers is dialed at any desired time of the day without the need for an operator. Midas' Data-Express runs on all IBM PC's and compatibles.

Currently in preparation at Midas is a combination of the LARS data bank and the Data-Express program. As is usually the case with such advance announcements, no information was available on when this product might be available. Others in the field will certainly not be disconsolate about that.

12552
CSO: 3698/240

NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH PROGRAM IN FRANCE

Laboratories, Projects

Paris ZERO UN INFORMATIQUE in French 17 Nov 86 pp 46-49

[Article by Jean-Pierre Laurent: "Sixteen Laboratories for French Research"]

[Text] The research efforts of some 20 teams spread throughout the Hexagon are being coalesced under the PRC-IA [Concerted Research Program-Artificial Intelligence].

The PRC-IA represents a national effort in the domain of artificial intelligence [AI]. This effort has the following objectives: First, to structure France's research potential in AI. The PRC will support action by these teams to reinforce their respective strong points and to develop their interactions (improvement of mutual acquaintanceship, working out of complementary research programs, exchanges of software, cooperation). The PRC aims to facilitate the implementation of an effective research policy through the participating teams.

Its second objective is to reinforce French research potential in AI. This means, on the one hand, beefing up the teams that are already very active, and on the other hand, commensurate with needs, supporting the development, and even the creation, of new teams. This reinforcing action will facilitate the transfer of technology from research to industry and will help to cover foreseeable training needs.

And its third objective is to become a scientific and technological AI "way point". AI is a diffusive technology, and its products and methods will become working tools for a growing number of laboratories and enteprises. The PRC plans to become a focal point of reference and information for all users: state of the art, locating of capabilities, forecasts.

The PRC-AI brings together, within a "laboratory without barriers," a small but open-ended number of teams active in the domain of AI. Each team participates on the basis of a multi-year contract, revisable year to year depending on the team's activity, its needs, and available funds.

The PRC places no direct constraints on the conduct of research by each team or on the choice of lines of research being or to be pursued. However, each team participates in the PRC only on a very limited number of research subjects, which although subject to reorientation with time must nevertheless maintain a certain continuity. The choice of subjects is based on proposals by the teams and discussion within the PRC. The aim of this policy is to foster the development of mutually supportive strong points among the teams. Its intent is to avoid the dispersal of research effort, without, however, introducing negative constraints on creativity.

Funding being allocated to the PRC to implement its startup operations is not a substitute for its funding, present and future, from other sources, but rather supplements the latter.

The PRC-IA's scientific program is structured around four Principal Areas of Research covering the following domains:

--Principal Area 1: Modeling of reasoning and knowledge;

--Principal Area 2: Modeling of analogy and learning;

--Principal Area 3: Analysis of inference and testing;

--Principal Area 4: Methodology of applications.

This structure is the product of several considerations. AI is basically an experimental discipline. Its development brings into play the activities involved in the creating, analysis and application of models, covered by the above four Principal Areas of Research. Because of their large volume, the activities concerned with the creation of models have been divided into two balanced Area (Areas 1 and 2). Principal Area 1 concerns subjects that are of current import. Principal Area 2 has more of a voluntarist cast, and is concerned with the development a sector of AI considered very important for the future. Principal Area 3 of the program is more specifically confined to the objective of developing solid theoretical bases for AI. Principal Area 4, like Area 2, is essentially voluntarist and is oriented towards augmenting our capacity to correctly utilize AI methods in problems of application.

Each Area is broken down into more precisely defined themes coalescing the individual researchers from several laboratories. The capabilities for interaction among all four Areas are potentially numerous, and will be taken into account in forming inter-Area working groups.

From Lannion to Marseilles and From Grenoble to Toulouse

The PRC-IA is formed as a Coordinated Research Group [GRECO] of the CNRS [National Center for Scientific Research]. This GRECO was created as of 1 July 1985, for an initial period of 2 and 1/2 years. Present funding of the PRC is being provided by the electronics sector of the Ministry of Research and. by the CNRS. Other sources of funding, private and public, are expected to materialize in 1986.

The PRC-AI is managed by an Executive Committee, which oversees the running of the PRC and the application of the decisions resulting from the thematic and operational orientations chosen. This Committee consists of a general coordinator and the heads of the four Principal Areas of Research. Each of them manages the operation and provides the fundamental leadership of his or her respective Area.

The Executive Committee is assisted by a Scientific Advisory Board consisting principally of the heads of teams participating in the PRC. This Committee debates periodically the thematic and operational orientations of the PRC.

A Steering Committee is responsible for evaluating, each year, the work being done under the PRC, and for drawing up recommendations concerning the orientation to be given to that work. This Committee consists of representatives of Government agencies, representatives of enterprises, and leading scientists (see related article [hereunder]).

During 1986, 20 research teams from public-sector agencies have taken part in the PRC-IA. All these teams have been conducting AI research for several years. They have published articles and scientific papers in the press and in conferences on artificial intelligence.

These teams have come from the following laboratories: IRISA [Institute for Research in Information Technology and Random Systems] (Rennes); LSI (Toulouse); LRI (Orsay); LIFIA [Laboratory for Fundamental Data Processing and Artificial Intelligence] (Grenoble); CNET [National Telecommunications Studies Center] (Lannion); INRIA [National Institute for Data Processing and Automation Research] (Rocquencourt); LAAS [Laboratory for Automation and Systems Analysis] (Toulouse); Paris VI; Paris Nord; GIA (Marseilles); GRTC (Marseilles); LIA (Chambery); U194 (INSERM [National Institute for Health and Medical Research]); Robot Vis (INRIA Rocquencourt); CRIN (Nancy); CERT-ONERA [National Office for Aerospace Studies and Research - Studies and Research Center, Toulouse] (Toulouse). Taken together, these laboratories are staffed by some 250 researchers, 90 of whom participate directly in the PRC in connection with the subjects covered by the scientific program.

These teams comprise a very important part of the French research potential embodied in the public sector. There are, however, other highly regarded teams which the PRC hopes to be able to sign up in 1986 or during the years that follow.

Funding specifically appropriated to the PRC-AI totaled around 6 MFF in 1985 and should total substantially more in 1986. In addition to the direct funding provided by the PRC-AI, funds allocated by other public-sector agencies to researchers participating in the PRC-AI (for salaries, equipment and operations) are estimated to total 25 MFF annually. To these must further be added approximately 7 MFF annually in contracts with enterprises.

Thus, a total of approximately 38 MFF in budgeted funding is being spent annually under the PRC-IA program by the participating teams.

Discovering Inner Workings of Learning and Reasoning Processes

Each of the PRC's four Principal Areas of Research consists of a number of subjects divided up among the different teams. The subjects of any one Area are grouped under themes coalescing the researchers of several teams.

Principal Area 1: Modeling of Reasoning and Knowledge: Addressing different concrete problem areas, the teams of Principal Area 1 seek to propose models of reasoning and knowledge, and experiment with software built on the basis of these models. Typical problem areas considered by this Area are:

--Analysis and characterization of a situation, as for example: diagnosis in medicine; trouble-shooting of malfunctions in systems; evaluation of financial or economic projects; monitoring of processes;

--Prediction of events, as for example: forecasting the malfunctions of a piece of equipment; weather forecasting; forecasting of avalanches; market forecasts;

--Planning of actions and testing the execution of plans, as for example: navigation of mobile robots; planning of manufactured product lines; management of activities on a work project; production of texts;

--Conceptualization of objects and systems: synthesis of forms; composition of objects; spatial allocation.

These different problem areas will focus the attention of the Area's researchers on the following fundamental themes:

--Fuzzy logic: Taking uncertain, imprecise, or incomplete knowledge into account to develop plausible and non-monotonic qualitative reasonings by default;

--Reasoning in evolutive situations: Taking time into account, implicitly or explicitly, to analyze changes of state, to generate plans of action, and to develop reasonings on the basis of givens in a real-time context;

--Geometrical reasoning: Development of representations to describe physical spaces and forms appropriate to the automation of reasonings, such as: planning of itineraries and movements; inference of the function of an object based on its form, and vice versa;

--Meta-reasoning: Developing reasoning models to deal critically with reasonings, with the object of steering them (choice of a mode of interpretation of knowledge from among several; choice of a strategy), evaluating them (soundness of the result; sensitivity to changes in givens), and explaining them.

--Combining of models: Combining several basic models appropriate to different classes of reasoning into a single system: combining the spatial and the temporal; the uncertain and the geometric.

The approved subjects of research in Area 1 are the following:

--Reasoning with uncertainties: a) approximate rules of inference, including typology, concatenation and composition of inferences; b) interdependence among lines of reasoning (LSI, Toulouse); c) reasoning based on the uncertain: d) symbolic representation of the uncertain for the testing of reasoning (LIFIA, Grenoble); e) reasoning by prediction and verification (INRIA, Rocquencourt); f) representation and processing of typicality and reasoning by default in an object-oriented context (GRTC, Marseilles); g) systems of maintenance of relationships and beliefs (CNET, Lannion); and h) processing of incomplete information and management of hypotheses (LRI, Orsay);

--Reasoning in evolutive situations: a) generation of plans for the creation of textual structures (LSI, Toulouse); b) generation of plans and testing of execution in robotics (LAAS, Toulouse); and c) taking time (durations) into account explicitly for the generation of plans of action (LIFIA, Grenoble);

--Geometrical reasoning: a) modeling and structuring the environment of a robot (LAAS, Toulouse); b) spatial and morphological reasoning for the recognition and manipulation of objects and avoidance of collision (INRIA, Rocquencourt); and c) inference of the physical description of an object based on its functions (LIFIA, Grenoble);

--Meta-reasoning: a) self observation of an inference motor and effective utilization of "bulk-stored" pieces of knowledge (Paris VI); b) self-explanation capabilities of inference motors: c) generation of critical inferences; d) use of explanatory knowledge bases (LRI, Orsay); and e) use of meta-knowledge in the demonstration of theorems (Paris VI);

--Combining of models: Development of a multi-function inference motor: space-time constraints, meta-reasoning, management of hypotheses (Paris VI); reasoning on the basis of heterogeneous pieces of knowledge (ERIC, Paris Nord).

Principal Area 2: Modeling of the Analogizing and Learning Processes: The different forms of analogizing lend themselves to a representation of the domain of nondeductive reasoning where complex and difficult-to-formalize pieces of knowledge must be taken into account.

The learning process, which expresses the manner in which the human being or the machine is capable of augmenting its store of knowledge and know-how, utilizes methods whose essential aim is to acquire new pieces of explicit knowledge based on prior knowledge, and to structure them so as to use them effectively.

The analogizing and learning processes develop common methodologies, which explains why they are grouped into the same PRC Principal Area: seeking of similitudes; reasoning in the presence of new givens; imperfect matches; methods of generalization of givens; reasonings by generalization.

The two themes of this Principal Area are a) analogy and b) learning. Analogy is a method of argumentative reasoning whose most generalized form is that which expresses intuitively the resemblance of relations among descriptions by the statement: "Description A is to Description B as Description C is to Description D." The problem is, on the one hand, that there is more than one method of matching A and B, and, on the other hand, that the matchings of two descriptions are often partial and uncertain.

As to learning, interest in this regard centers essentially on "symbolic" learning, as differentiated from so-called "numerical" approaches developed in disciplines other than AI. It has to do specifically with:

--Detecting similarities among sets of examples, or exhibiting the differences between examples or counter-examples;

--Singling out the useful "explanations" for justifying a piece of knowledge.

As regards analogy, research is centered particularly on a) the construction of an analogical inferences motor; b) applications of reasoning supported by figures of rhetoric to analysis (comprehension of natural language) and to the automatic acquisition of knowledge (GRTC, Marseilles); c) design and construction of an analogical "reasoner" (CRIN, Nancy); and c) the study of analogical reasoning for reuse of software modules (CNET, Lannion).

In the learning domain, the approved subjects are: a) study of automatic classification guided by the store of intermediate concepts, and its application to the automatic construction of taxonomies (LRI, Orsay); b) the combining of numerical and symbolical methods to combine the effectiveness of recognition with explicability of the recognition functions (LRI, Orsay); and c) learning by analysis of setbacks and successes in the resolution of problems, coupled with automatic generation of rules improving the performance of the resolution system (LIFIA, Grenoble).

Principal Area 3: Analysis of inference and testing: Interest here is centered on the power and operational applicability of reasoning and knowledge models, starting with which, as points of departure, research is directed towards: a)developing concise and precise representations lending themselves to formal analysis; b) using these representations to demonstrate fundamental properties (for example: validity, "completude" [French term defined as: "Property of a consistent deductive theory wherein every formula is decidable"]); and c) associating these representations with operating procedures that are effective from the standpoints of time and memory function.

These objectives have generated four research themes:

--Automatic demonstration in classic logic: Isolating effective procedures capable of deciding that one logical formula is the consequence of a set of other logical formulas. This theme is limited to the logic of first-order predicates;

--Studies of non-classic logics: The expression of knowledge can be facilitated by the use of modal logic, temporal logic, non-monotonic logic, etc. The study of these logics is aimed at constructing inference procedures representing reasoning models;

--Properties of plausible-reasoning models: The objective is to study and develop solid bases on which to erect formalisms of often empirical origin, which use knowledge and facts to which "degrees of plausibility" are attached;

--Transformation of models: Defining methods of transforming knowledge bases and/or reasoning-procedures bases, to cast them in a more execution-effective form.

Present research is centered on automatic demonstration in classic logic: Testing methods based on the resolution of linear whole-number systems (GIA, Marseilles); automation of testing by recurrence (LRI, Orsay); improvement of testing methods, particularly by the use of parallelism and learning (LIFIA, Grenoble).

As regards the study of non-classic logics, the following topics have been selected: a) modal and temporal logics--formalization of reasoning, automatic deduction, extension of logical programming (LSI, Toulouse); b) temporal logics--methods of demonstration and application to the comprehension of natural language (GRTC, Marseilles); c) properties of circumscription and application to common-sense reasoning (IRISA, Rennes); and d) non-classic logics and knowledge bases--comparison between formalisms (ERIC, Paris Nord).

The properties of models of reasoning in uncertainties are being studied by way of the following themes: a) symbolic methods for the drawing of plausible inferences--modulation of inferences and composition of modulations (LRI, Orsay); b) testing for the propagation and combination of uncertainty and imprecision (LSI, Toulouse); and c) fuzzy differentiation aimed at unlocking rules of imprecision and/or uncertainty (LSI, Toulouse).

In the domain of transformation of models, research is being centered on the compiling of a knowledge base using a global perception of the role of research (LAAS, Toulouse).

Principal Area 4: Methodology of Applications: Entirely new problems are posed by the development of software systems using AI methods: New semantics (approximate reasonings; uncertain givens); construction of large knowledge bases (example: certain expert systems).

The general objective of this Area is to develop suitable methods for guiding the design, development, refining, testing and maintenance of these software systems of another type.

Initially, research in this Area will be devoted principally to the identification of concepts enabling the addressing of methodological problems. Meanwhile, the medium-term aim will also be to produce tools that can be used effectively by the engineer developing an AI system.

Being contemplated are tools to aid in: a) the acquisition of knowledge in a given domain; b) the choice of formalisms for the representation of knowledge; c) the choice of reasoning mechanisms; d) the verification of coherence in knowledge bases; e) the testing of systems; and f) the evaluation of performance of systems. However, this is not an exhaustive list.

To date, the research themes deriving therefrom are:

--Design of systems based on knowledge bases: Identification of the characteristics of a domain of application aimed at permitting a classification of the problems, and development of criteria of choice as to the mode of representation of knowledge and as to type of testing. In due time, tools to aid in the specifying of the architecture of such systems should be achievable;

--Coherence of knowledge bases: The construction of a large-scale knowledge base poses in a crucial way the problem of coherence of the knowledge in question. This problem can be addressed from the standpoint of validation of an existing base. It is also possible to study how to preserve coherence when a supplementary piece of knowledge is added (dynamic construction of knowledge bases);

--Analysis of tools on the basis of concrete cases: It is proposed to study existing systems exhibiting a certain generality, through experimental work on concrete cases.

The approved subjects, insofar as concerns the design of systems based on knowledge bases, are: a) the classification of problems and the development of criteria of choice (CRIN, Nancy); b) aid to specifying the architecture of a system based on knowledge bases (LIA, Chambery); c) architecture of cooperating expert systems (CNET, Lannion); and d) study of cooperating modules for the design and construction of complex systems (LIA, Chambery).

In the domain of knowledge-base coherence, research is centered on the coherence and validation of a knowledge base (LRI, Orsay), and tested acquisition of knowledge (LIA, Chambery).

Other research in this Area is centered on the inference motors Snark (Paris VI), Tango and Zero+ (LRI, Orsay).

Inner Workings of Program

Paris ZERO UN INFORMATIQUE in French 17 Nov 86 p 49

[Article by Jean-Pierre Laurent: "Research and Industry: Development of Ties a Prime Objective"]

[Text] The researchers do not want to be cut off from the industrial world and are even proposing partnership contracts, through the PRC-IA.

The conduct of the research program in artificial intelligence is being supervised by three bodies.

The Executive Committee is a decision-making body which manages the conduct of the PRC-IA. It is composed of a general coordinator and the heads of the program's four Principal Areas of Research. During 1985-1986, general coordination has been provided jointly by Henri Farreny and Jean-Claude Latombe. The heads of the Principal Areas of Research are, respectively: Henri Farreny (Principal Area 1), Yves Kodratoff (Principal Area 2), Laurent Trilling (Principal Area 3), and Jean-Pierre Laurent (Principal Area 4).

The principal tasks of the Executive Committee include: a) the drawing up of the scientific program, in close collaboration with the Scientific Advisory Board; b) general oversight and coordination of the work of the participating teams; c) imparting movement to the research effort through working sessions on a theme, on a Principal Area, etc.; d) management of PRC funds: assignment, distribution; and e) conduct of external relations: relations with the scientific community, international relations, relations with industry. The Executive Committee meets approximately every 6 weeks.

The Scientific Advisory Board assists the Executive Committee on all important questions connected with the running of the PRC. In particular, it debates the PRC's thematic and operational orientations. It consists mainly of the heads of PRC-IA participating teams. During 1985-1986, all the heads of teams have been members of the Scientific Advisory Board.

The tasks of the Scientific Advisory Board include: a) drawing up of the scientific program on the basis of proposals from the teams; b) discussion of problems and methods of general interest (strategy as regards data processing equipment in particular); c) drawing up overall guidelines for the assignment of available funds; and d) considering the applications of other teams to participate in the PRC-IA. The Scientific Advisory Board meets approximately every 3 months.

The Steering Committee is not involved in the day-to-day management of the PRC-IA. It is charged with evaluating, each year, the quality of the research being done under the PRC-IA, and with issuing recommendations on future orientations. These recommendations are communicated to the parent organizations, the MRT and the CNRS.

In 1986, the PRC-IA Steering Committee has been made up of 15 leading figures representing Government agencies (Ministry of Research and Higher Education, CNRS, INRIA, CNET, DRET) and industrial enterprises. It meets once a year.

Three ways of diffusing the results attained under the aegis of the PRC-IA teams are planned: a) work seminars (meetings of Principal Areas, meetings on given themes, etc) to be held throughout the year; b) annual national symposiums dedicated to a comprehensive presentation of the results attained; and c) scientific and technical reports published by the PRC-IA on the results attained under the scientific program.

This diffusion will provide the PRC with an opportunity to strengthen its ties with the scientific community, particularly with teams participating in other national research programs. It is, of course, in addition to the customary releases made by the researchers in publications and in conferences.

Most of the teams participating in the PRC-IA maintain close relations, frequently contractual ones, with entities interested in the use of artificial intelligence. Among the problems of application on which the PRC-IA are working, the following can be cited: aids to exploration for hydrocarbons, aids to health care for diabetics; system control in the production of manufactured goods; analysis of classified ads; troubleshooting of equipment malfunctions; aids to design in architecture and mechanics; aids to archeological research; industrial process control; road traffic control; word processing; signal analysis; analysis of volcanic risks; aids to mining prospection; forecasting of avalanches; design of machining product lines; robotics and computerized vision.

Certain of the PRC-IA teams are also working with AI firms to develop software tools for the development of systems: specialized languages; cores and environments of expert systems. And several PRC-IA teams have an advisory role to enterprises using or producing AI products.

In all, PRC-IA team contracts with business and industrial firms can be estimated to represent a total annual revenue of around 7 MFF.

The PRC-IA's objective is to neither interfere with the relations maintained between teams and industry nor augment the number of these relations, but rather to foster such conditions as will improve the transfer of know-how and technology on an open-door basis to an even larger number of enterprises.

High priority is being given to the diffusion of information to business and industrial firms and to their participation in certain PRC debates. This action is directed towards enterprises that have signed a membership agreement with the PRC. Such an agreement provides the following ties between the PRC and an enterprise: In exchange for a fixed annual fee, the enterprise

is invited to all the technical meetings organized by the PRC (seminars, annual symposiums) and automatically receives all the documents published by the PRC. Member industrialists are expected to participate actively, especially in the debates contributing to the defining of the PRC's scientific progam. A separate document describes in detail the terms of a membership agreement.

In addition to these membership agreements, certain enterprises, which have chosen a more extensive involvement in AI, may wish a cooperation in greater depth with the PRC-IA. To these enterprises, the PRC offers the possibility of partnership contracts: The enterprise concerned places one or more of its engineers on full-time or part-time detached service as members of PRC-IA teams, to perform research work on subjects chosen under the PRC program. Clearly, these contracts in no way preclude the enterprises from having direct relations with teams, independently of the PRC.

To increase technology transfers, the PRC-IA plans to mediate actively with Government bodies in support of partnership agreements between enterprises and research teams aimed at developing AI products based on the results of research.

Traditionally, AI teams maintain ongoing relations with foreign laboratories, particularly U. S. laboratories. As of recently, several teams have participated in European contracts, particularly under the Esprit project. In 1985, some 3 MFF are estimated to have been spent by PRCIA participating teams for their international activities.

The PRC-IA aims, on the one hand, to develop the participation of its teams in international projects such as Esprit and Eureka, and on the other hand, to increase the opportunities being offered to researchers for research involving extended stays abroad with foreign laboratories.

9399
CSO: 3698/116

EUROPEAN SOFTWARE STANDARDIZATION PROJECTS IN EUREKA, ESPRIT

Paris ZERO UN INFORMATIQUE in French 21 Jul 86 p 5

[Article by Edouard Launet: "Grey Europe in Better Shape Than Green Europe"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Text] European grey matter in the field of software engineering is taking shape. The recently "labeled" EUREKA projects delineate this shape.

Software engineering has really become a European affair. The reason is simple: The cost of developing large software tools is so high that no data processing services and engineering company can consider embarking upon such a venture on its own. An association of companies on a national level could certainly have acquired sufficient financial and technical resources for this task, but the market for products thus developed would also have been limited by national borders.

Large-scale software engineering activities therefore required the establishment of European standards. The first stage consisted of defining an outline of activities.

This outline began to take shape through the ESPRIT PCTE (Portable Common Tools Environment) project launched in 1983 by the large European manufacturers (Bull, ICL [International Computers Limited], Siemens, GEC [General Electric Company], Nixdorf, Olivetti). PCTE's purpose is to define a common interface for all software engineering tools.

On the basis of these specifications and the work conducted within the framework of the national software engineering project, a GIE [Economic Interest Group] associating Bull, Syseca, and Eurosoft has developed Emeraude, an access structure, i.e., an environment for building software engineering workshops.

Emeraude consists of a software layer superimposed on a set of intercommunicating Unix systems. It is a sort of modular engineering workshop distributed over various workstations (SPS-7). This access structure will be available in a few weeks.

The PCTE project has now been expanded with a new ESPRIT program named PACT (PCTE Added Common Tools). The objective of PACT, this time headed by Bull, ICL, GEC, Olivetti, Eurosoft, and Syseca, is to complete the initial structures of software tools.

In the wake of Emeraude and other European projects, the French SFGL (French Software Engineering Co.: Bull, CERCI [Company for Industrial Cybernetic Study and Products], Eurosoft, Informatique Internationale, SESA [Automation Systems Study Co.], STERIA [R&D Company for Data Processing and Automation], and Syseca), constitutes an attempt to combine national efforts in developing engineering workshops. It is however noteworthy that Cap Sogeti (and Sema Metra) are not represented in SFGL.

Are EAST and ESF Complementary Projects?

Changing from an incentive program to an ESPRIT project, work in software engineering has taken on a European scale. With EUREKA's real inception in London last month [30 June], record speeds are now being broken. European products should be available in the medium term (3 to 6 years).

The new batch of projects that recently acquired the EUREKA label includes two mammoths: EAST (EUREKA Advanced Software Technology)--Fr 743 million over 6 years--and ESF (European Software Factory)--Fr 2,218 million over 10 years. The two projects, which could be called brotherly enemies, share the common goal of promoting the development of software engineering workshops.

EAST is being led by SFGL in cooperation with Danish, Finnish, Italian, and Swiss partners. The workshops to be produced by this consortium will stem from the Emeraude access structure and cover sectors such as systems data processing, management applications, and artificial intelligence. An initial 3-year stage should lead to the first integrated workshops. The following stage will consist of integrating complementary tools, making "extensive use" of conventional techniques, and the introduction of artificial intelligence.

The second project, ESF, is conducted by Cap Sogeti and Nixdorf in conjunction with Sema Metra in France, Softlab and AEG [General Electric Co.] in the FRG, and finally Telelogic, a subsidiary of the Swedish PTT [Post, Telephone, and Telegraph].

It is worth noting that the three service companies thus assembled are currently marketing their own software tools (Multipro by Cap Sogeti, Metra by Sema, and Maestro by Softlab), in which, they insist, considerable investment has been made. The motives leading these data processing services and engineering companies to embark on a markedly different course than that of the EAST project can thus be better understood. They were not at all enthusiastic about returning to the new starting point imposed by the adoption of the Emeraude structure.

Anxious to take advantage of their "lead," the partners of the ESF project decided to set their goals even higher than their competitors by launching an

ambitious 10-year program whose goal is increased industrialization of software production processes. The program involves developing software factories, making clear that "the concept of factory refers to the definition and subsequent standardization of high-level concepts which, using standardized interfaces, are capable of exchanging software engineering tools and prefabricated software modules between workstations and between systems."

This factory, configurable according to the applications envisaged (type, size), would consist of three layers: a standardized user interface bus, different classes of software components linked by a tool bus, and a database which manages the whole production process and allows parts of existing programs to be reused.

The program is ambitious but is there no risk that EAST and ESF will set off on incompatible courses, transforming European software engineering into a two-headed monster and thus making it less efficient? "We do not reject the results of the PCTE project," maintains Bernard Lorimy, deputy director of operations at Cap, "we will work on this basis (interface specifications) but it will be expanded to concepts of a higher level."

The split seems rather to be situated on the level of applications targeted. Led by Cap Sogeti, ESF tends toward management, whereas EAST, due to the choice of Unix in Emeraude, focuses primarily on science and computer integrated manufacturing.

Meanwhile, the London EUREKA conference studiously avoided settling the dispute by giving its passport to EAST and granting an 18-month residence permit (definition phase) to ESF. Tune in again in 1 and 1/2 years.

A Multimedia Distributed System for Testing OSI

Another large project approved in London is MOSES (Multimedia Open Standard European System). It groups Bull, Copernique, and ICL around the following objective: Defining the architectural bases of a multimedia system, i.e., capable of managing data, images, or voice, and subsequently developing a series of products conforming to the specifications adopted. It will take 3 years and a Fr 500-million budget (including Fr 275 million from France).

MOSES will be a distributed system relying on networks of workstations and servers integrating communication standards into the OSI [Open Systems Interconnection] standard. The system will use the X-400 messaging standard for document transmission and the new ODA (Office Document Architecture) standards which define the structure of multimedia documents including texts, images, graphics, and voice remarks.

The three manufacturers have adopted the status of "associated partners." This allows other companies wishing to develop equipment compatible with the MOSES architecture to receive the technical data on MOSES as well as on the OSI and CCITT [Consultative Committee of International Telephone and

Telegraph] standards selected for the project, and to receive instructions about validation procedures.

It is interesting to note that IN-Informatique and Entel (a subsidiary of the Spanish Telephonica group) are also going to develop a multimedia database within the framework of a EUREKA project (BD-11). However, the emphasis will be on artificial intelligence techniques.

Finally, a word about the French-English project involving an ADA workshop for real-time applications, associating Alsys with Logica and Imperial Software Technology.

This "small" project (cost: Fr 26 million; duration: 2 years) aims at promoting the use of ADA in computer integrated manufacturing applications. To that end the consortium will develop a compiler which allows cross-programming and is intended for the main processors (Intel, Motorola,...) used in industry.

Although the industrial partners have signed the memoranda of understanding for all these projects, they still have to obtain the signatures from the responsible authorities (in France this is DIELI [Directorate of the Electronics and Data Processing Industries] which has recently taken the electronics sector off the hands of the DGT [General Directorate of Telecommunications]). These signatures will lock in the government's financial contribution to the projects (30 to 50 percent of the cost depending on the project). France will allocate Fr 400 million to the EUREKA program in 1986.

Other countries with special EUREKA funds are the FRG ($18 million in 1986; $100 million in 1987?), Denmark ($3 million in 1986), the Netherlands ($15 million in 1986), and Portugal ($2.7 million in 1986). The UK, like Belgium and Austria, will contribute to the projects by drawing on existing research funds.

25 047/9599
CSO: 3698/A013

PHILIPS, ESPRIT PROGRAMS IN ADVANCED COMPUTING

Amsterdam COMPUTABLE in Dutch 28 Nov 86 p 11

[Unattributed article: "Philips is Building Fifth-Generation Computers with Support from SPIN and Four Netherlands Universities"]

[Text] Delft--Philips will work with four universities on the development and construction of a fifth-generation computer. The project is under the auspices of the Team for Project Stimulation in Data Processing Research (SPIN). It will be spread over 4 years and cost 25 million guilders.

According to Philips, the development of this "Parallel Inference and Storage Machine," popularly known as PRISMA, paves the way for new applications in office automation, manufacturing control, medical data interpretation, and statistical databases. According to Eng H. Struch of SPIN, the PRISMA project thus primarily focuses on handling very large data files and expanding application possibilities. The project's participants are striving for a data processing system allowing integrated data and knowledge processing by means of a parallel computer comprising hundreds of processors. Such a system processes several elements of a question simultaneously and merges them into an answer. In other words, the PRISMA computer reaches very high speeds and has a large memory capacity. Moreover, parallel technique is distinguished by a very high error tolerance; the machine continues to operate even when parts break down.

Task Allocation

At present parallel data processing is still in its infancy, and solutions have to be found for fundamental problems like distributed information storage, internal communication, and the unambiguous meaning of knowledge data, To tackle these problems in a structured way, there is a strict distribution of tasks within the project. The emphasis centers on the Physics Laboratory of Philips, which is closely collaborating with the University of Amsterdam on the design and construction of the hardware and the development of the operating system.

The State University of Leiden will work on the allocation question, i.e., how the computer program is to be distributed among the processors. The State

University of Utrecht will concentrate on rewrite systems, and the Technical University of Twente, in collaboration with the Center for Mathematics and Data Processing (CWI), is responsible for the development of a database language for manipulating data in a database.

ESPRIT

Although Japan and the United States are working hard on the development of fifth-generation computers, Dr A. J. Nijman of the Philips Physics Laboratory says that this does not automatically imply that Europe, and more particularly, the Netherlands, are behind in this area. In this connection Nijman mentioned that Philips has been working for the past 2 years on the development of complicated machines for database management. Moreover, Philips is participating in an ESPRIT project for the design of a parallel computer for non-numerical calculations. Nijman thinks that this experience can be put to excellent use in the PRISMA project so that the progress will be more rapid.

In ESPRIT, 75 million guilders have been allocated to projects involving parallel computer systems, which is comparable with the funding of similar developments in Japan, according to Nijman.

Eng H. Struch, the director of SPIN, which has allocated a total of 5.5 million guilders to PRISMA, stated that the computer development project is of strategic importance for the Netherlands. Struch said that Europe can make a major contribution to knowledge and expertise in this sector, provided, however, that research cooperation--both between universities and between universities and industry--is stepped up.

25057/12851
CSO: 3698/A071

FRENCH FIRMS, LABS RECEIVE CRAY SUPERCOMPUTERS

Ecole Polytechnique Acquires Cray 2

Paris ELECTRONIQUE ACTUALITES in French 21 Nov 86 p 6

[Unsigned article: "Cray Benefits From Unexpected Rapid Development in Supercomputer Market"]

[Excerpts] The American manufacturer Cray, one of whose Cray 2 supercomputers will be installed at Ecole Polytechnique at the end of 1986, announced a net profit of $100 million for the first nine months of this year, with revenues of $450 million.

At the end of this year, at its Center for Vector Computation for Research, Ecole Polytechnique will have a Cray 2, the first in France, to replace the Cray 1S installed in 1983. This acquisition represents about $19 million. At the same time, CISI (International Company for Computer Services) and the French Petroleum Institute (IFP) will share a Cray XMP. Next year, Cray France will install four other XMP computers, at Aerospatiale in Toulouse, ONERA in Paris, and CEA.

Access to Cray at Ecole Polytechnique

Paris AFP SCIENCES in French 18 Dec 86 p 19

[Unsigned article: "Cray 2 Installed at Ecole Polytechnique"]

[Text] Palaiseau--The Cray 2 at the Center for Vector Computation for Research was officially installed on 15 December at Ecole Polytechnique. It will be used for applications in scientific research, meteorology, mathematics, aerospace, oceanography, and non-military nuclear research.

Researchers from a total of 10 organizations, members of an economic interest group formed for the purpose, will have access to it. These will be workers from CISI, CNES (National Space Studies Center), CNRS (National Center for

Scientific Research), DGA (General Directorate for Weapons), Ecole Polytechnique, the Ministry of National Education, IFREMER, INRIA (National Institute for Information Technology and Automation Research), the National Meteorology organization, and ONERA (National Office for Aeronautical Studies and Research).

With this acquisition and installation, France has become the third country in Europe to have a Cray 2, currently the most powerful computer in the world. The Ecole Polytechnique Cray 2 is the seventh in the series. It cost about $18.9 million and was delivered less than 18 months after the first Cray 2 was received by Livermore Magnetic Fusion Energy Laboratory, one of the large American laboratories working on thermonuclear fusion and an SDI participant.

The Cray 2, which can perform 1.2 billion calculations per second, and which has a central memory of 2 billion bytes, corresponding to the content of 16 magnetic tapes, will allow researchers to explore three-dimensional models whose processing could not be considered until now.

Peugeot Installs XMP/14

Paris AFP SCIENCES in French 18 Dec 86 pp 48-51

[Unsigned article: "Scientific Computation, Indispensible Tool for Management. Peugeot Group Technology"]

La Garenne Colombes--Scientific computation has now become technology's indispensible tool for going faster and further. The Technical Directorate of the PSA group Europe (Peugeot-Citroen automobiles) has understood this sufficiently well to acquire a new computer, the Cray XMP/14, the most powerful computer in the world, which will increase the power and speed of the scientific computation provided for engineers and technicians in its Studies Offices, aimed at studying, designing, and manufacturing new vehicles.

Peugeot, which along with Opel is the only one in the European automobile industry to own a Cray in addition to more conventional computers (IBM, Amdhal, Digital, Tandem, and so on), will have to expand its computer teams and hire high level engineers, a situation which could prove to be very attractive to young scientists.

The Technical Directorate of the group points out that the arrival of a new generation of vector computers will expand the field of possible computation, particularly in the three following strategic areas:

Combustion, where digital simulation of combustion phenomena and aerothermochemistry will offer much more detailed understanding and will make it possible to predict stratified charges, injection angles, thermal losses, and combustion residues as a function of chamber dimensions and shapes. Major

work in this field is being carried out in collaboration with other manufacturers in the European framework of JCR (Joint Research Committee), an outgrowth of CCMC (Committee of Common Market Manufacturers). In France, PSA is working with Renault and IFP within GSM (Scientific Group for Engines), as well as with many scientific and university organizations;

Acoustics, where total modeling of phenomena is extremely detailed and difficult (because for instance, noise transmission from a source such as an engine or tire, into the car where it is perceived, can use different paths). In this area, PSA has started a collaboration with the University of Compiegne, aimed at building an original program based both on finite elements and integral equations;

Crashes, a particular case in which the group's Technical Directorate has successfully created a simulation (car running into a wall). This is a hypothetical BX Citroen crash carried out in collaboration with Societe Engineering International. The software, called PAM-CRASH, is already broadly optimized on a Cray. Despite a factor of 25 (25 times faster) compared to the Amdhal 58 60, 11 hours of computation were required on the Cray XMP/14 to exactly simulate the first 80 milliseconds after impact, thanks to a tight network of 8000 nodes.

Many other fields will benefit from the contribution of computing power: road handling (side winds, lane changes, and so on), stamped metal fitting, mechanical behavior of rubber and new materials, lubrication and heat generation in mechanical parts, aerodynamics, and so on.

11,023
CSO: 3698/183

RESEARCH AT FRANCE'S INRIA CENTERS ON AI, ROBOTICS

Paris LES ECHOS in French 22 Sep 86 p 38

[Article by M. L. T.: "Technology Transfers a Priority"]

[Text] Twenty percent of the INRIA's [National Institute for Data Processing and Automation Research] budget, which totals around 300 million francs, is self-financed: Research contracts with industrialists, incentive financing via other entities such as the CNET, revenues from commercialized products, and organization of lectures and seminars. As successor of the former IRIA, formed by the Government under the Calcul Plan, and placed under the aegis of the Ministry of Research and Industry, INRIA's sole vocation is research.

For the Institute, technology transfers, in all their forms, are also a must. "The majority of the research work done at INRIA is done with industrial applications in mind," says Laura Reinhardt, managing director for commercialization and industrial relations.

The 55 projects now under way have been grouped under eight themes which define the scientific orientation of the Institute: Symbolic reckoning and planning and artificial intelligence, data-processing system architectures, distributed system networks, and data bases, comprise the data processing segment. Signal processing, robotic imaging and vision, computer-aided engineering and scientific reckoning, and man-machine communication are grouped under the heading of automation.

From Scientific Reckoning to Artificial Intelligence

Scientific reckoning, once the main pillar of research at the INRIA, has been overtaken by artificial intelligence, systems architecture, networks, and robotics. No plan of specialization has been laid down to differentiate among the three sites located at Rocquencourt, Rennes and Sophia-Antipolis. But the Rocquencourt center is by far the largest. It employs 363 persons full time, more than half the Institute's permanent staff (500 persons, 200 of whom are in scientific categories). INRIA also employs an additional 250-300 external researchers: scholars, trainees, visiting foreign researchers, university researchers on detached assignment, and engineers from industry.

As an organization with a very wide open door to the outside world--the university world as well as the industrial sector--INRIA has access to a broad gamut of cooperative arrangements with enterprises, organizations and Government authorities. Cooperation with industry is realized by way of research contracts, some 60 of which were signed in 1985. These contracts are signed either directly by industrialists or by outside organizations for incentive purposes.

Contributions by industry totaled 14.5 million francs in 1985, while incentive contributions totaled 16.5 million francs. Thus, the Sycomore national project brought together Bull, Thomson, the INPG (National Polytechnic Institute-Grenoble), and the INRIA, in a joint effort to come up with an integrated software system for the design and testing of very-high-density integrated circuits. Bull-SEMS, the CNET and INRIA formed GIPSI [Scientific and Data Processing Public Interest Group] to develop hardware and software products around the CNET's SM 90 architecture, for the design and building of competitive scientific workstations.

Based at Rocquencourt, GIPSI was created in 1984 for a period of 8 years. Its work has already enabled a quick shift to industrialization, with Bull's SPS 7. Direct cooperation with industry takes place by way of research contracts with data processing industries and major users. A technical exchange between researchers and industrialists generally precedes the signing of the contracts.

The INRIA collaborates in this way with the CFP [French Petroleum Company] and Elf-Aquitaine for scientific reckoning, with Renault and IRSID [Steelmaking Research Institute] for automation, etc. INRIA also works in partnership with industrialists to promote its products by way of industrialization and commercialization agreements. The quasi-exponential growth of these agreements attests to a certain maturity in the sphere of research. Some 15 have already been signed in 1986--particularly for LISP, an artificial intelligence language derived from LISP [as published]; with firms like ACT-Informatique for data microprocessing, with CRIL and CISI for larger-sized computers; and with manufacturers like Bull and Matra.

Work Shared With Industrialists

In image-processing softwares, Inrimage, is being shared with Digital Design and CSEE. These commercialization agreements sometimes generate new enterprises. This is the case, for example, of Noesis. Created by engineers of the School of Mines and of INRIA, this firm, installed near Versailles, develops amd commercializes image-processing softwares. Its new product Visilog is in a way the fruit of a cross between INRIA's Inrimage and the School of Mines' Morphologue software.

Another firm belonging to the INRIA sphere of influence, Simulog, is an out-and-out subsidiary of the Institute, which owns 51 percent of the firm's capital shares. The rest are owned by Framatome (22.5 percent) and Serete

(22.5 percent) [as published]. "We industrialize products derived from research in the CAE [computer-aided engineering] sector," says Christian Saguez, general manager of Simulog and a former INRIA researcher. INRIA furnishes us the basic developments; Serete and Framatome contribute their industrial components: knowledge of the markets and of the industrial structures." Simulog's catalog lists several products that are the direct outcome of INRIA research, such as SICLA (Interactive Filing System], VISIL (Display of Results for Scientific Reckoning], and BASIL (a CAD tool).

Other products, such as SIMAIL (Interactive Networking System), have been developed by the firm in its own right, on the basis of INRIA algorithms and modules. Formed in 1984, Simulog employs some 20 persons, and expects to attain a revenue of 10 million francs in 1986 and a position in foreign markets. "The creating of subsidiaries to industrialize the products of research is a very good way to go," concludes Christian Saguez, "provided the role of each subsidiary is well defined." Still other firms have emerged within the INRIA sphere: Info-Sys, for high-performance data base management systems; and Robosoft, which designs and builds mobile robots at Levallois.

INRIA is also associated with other entities and industrialists for the European Esprit and Eureka projects. Under Esprit, 13 projects in which the Institute participates have been approved, involving an investment of some 30 persons a year.

In this regard, INRIA cooperates with ICL, Cap Sogeti, and SEMA for software engineering projects; and with Bull-Transac for smart workstations. A Eureka project is in progress with Matra-Norsk Data on parallel architectures. Generally speaking, the INRIA may be likened to its big neighbors, the CNET [National Center for Telecommunications Research], the CNRS, and the engineering schools, for new programs.

9238
CSO: 3698/169

AI PROJECTS FOR FRG CHEMISTRY, ELECTRONICS, AUTO INDUSTRIES

Le Chesnay BULLETIN DE LIAISON DE LA RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE in French Oct-Nov 86 pp 21-25

[Article by Peter Hoschka and Dieter Bungers of GMD: "Knowledge Processing"; first two paragraphs are BULLETIN DE LIAISON DE LA RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE introduction]

[Text] For many years, knowledge and artificial intelligence processing have received very limited funding in the FRG. Until about 1980, only very small groups and a few universities conducted research in this field. In all honesty, we must admit that artificial intelligence is currently not in favor in all FRG universities, and its supporters have long faced opposition in their departments.

This situation has changed dramatically since the early 1980's. Interest and funding for knowledge processing are now very strong in universities and research institutes as well as in industry. As throughout the world, this field has undergone extraordinary development. FRG and European information technology development programs have played a major role in the creation and establishment of research capabilities.

This progress is the clear result of both government efforts to provide research orientation and of significant commitment by researchers and students. The large number of highly qualified students who have entered this field is remarkable. There is thus some hope that the main problem currently facing knowledge processing in the FRG and throughout the world, i.e., scarcity of qualified personnel, will at least be reduced in the future.

However, past neglect of this field naturally continues to have consequences today. Both research and training are concentrated in a relatively small number of locations. The universities of Berlin, Erlangen, Hamburg, Kaiserslautern, Karlsruhe, Munich, Saarbruecken, and Stuttgart can be mentioned in particular. There are other projects at the universities of Bielefeld, Dortmund, Oldenburg, and Ulm. Outside the universities, the Society for Mathematics and Data Processing (GMD) and the Fraunhofer Society have energetically developed this field in recent years.

In industry, the largest FRG data processing technology manufacturers have now become engaged in "knowledge processing," particularly Nixdorf, Siemens, and Triumph Adler, which have developed a few products for this market. Smaller manufacturers, such as Peripheral Computer Systems (PCS) of Munich, have also set up research groups. Software and consulting companies, on the other hand, are not yet so seriously involved. There are exceptions, such as SCS [Scientific Computer Systems] in Hamburg. ADV/ORGA in Wilhelmshaven, Danet in Darmstadt, and Inter-Face and GEI in Munich. Moreover, companies such as Dornier in Friedrichshafen and Battelle in Frankfurt offer similar services.

A look at the users will clarify the current situation. Many large companies--such as BMW, Bayer, Krupp, Daimler Benz, Deutsche Bank, etc.--have launched AI projects. However, with few exceptions, these companies cannot yet be said to have made major investments in this field; efforts are still concentrated primarily on developing demonstration systems and prototypes, which must be used to prepare for larger investments. Industrial users in the FRG are very interested, but they would like to see proof of the usefulness and implementation capacity of this technology in specific applications.

The automobile industry leads the field, followed by the machine building and chemical industries; obviously the data processing technology industry itself is attempting to develop its own convincing applications. In the FRG, as in other countries, the service sector of the economy has not yet decided to try knowledge processing technologies, as manufacturing is doing; banks and insurance companies are even further from doing so. Finally, it should be mentioned that military applications are also significant.

In short, the current state of knowledge processing in the FRG can be described as follows: large and expanding research capacities (although limited by inadequate personnel resources); strong commitment by data processing manufacturers; a receptive, but wait-and-see attitude on the part of users. The market has not yet been established in the FRG and is only beginning to form.

Applications

As mentioned earlier, the German automobile industry plays a leading role in the industrial implementation of expert systems in the FRG. In association with Siemens, BMW, Daimler Benz, and Volkswagen founded a company for innovation within the automobile industry in Berlin in 1983, the Innovation Company for Advanced Production Systems in the Automobile Industry (INPRO). As central focus of its activities (in addition to robotics and the simulation of manufacturing processes), it sets up expert systems for companies. During the years since its establishment, engine diagnostics as a part of quality control has been identified as a first application and learning experience, and Daimler Benz was selected as a pilot user. The IXMO expert system developed for this purpose is based on the medical diagnostic system MEDI (META-Ebenen Diagnosesystem), originally developed in a thesis at Kaiserslautern University.

IXMO was not developed by INPRO itself, but by the University of Kaiserslautern. However, in the meantime INPRO had created its own expert system team of some eight members. Shortly before completion of this system, the team had access to another system for planning sheet metal production and processing. INPRO's philosophy is to distribute the results of such pilot developments in the form of "expert systems shells" before they are put on the market by the competing parent companies: BMW, Daimler Benz, and Volkswagen. This was the case for the IXMO engine diagnostics system: A second version has since been created for quality control of the BMW engine manufacturing plant in Steyr, Austria.

At about the same time, Ford entered the field and developed, with the GMD, an expert system for diagnosing defects in C3-type automatic transmissions, called DEX.C3. Developed as a demonstration system, it was used to initiate expert system modernization procedures at Ford.

Other key applications in industry have been developed under the 1984-1985 joint program established by the Federal Ministry for Research and Technology [BMFT] (see below).

The expert system hardware market is dominated primarily by German subsidiaries of U.S. companies. The first of these (Symbolics, Inc.) was set up in early 1984 in Eschborn/Taunus near Frankfurt under the name of Symbolics GmbH and within 2 years climbed to the top of the German market for highly sophisticated AI workstations with some 120 systems installed. Xerox and Siemens should also be mentioned, both of which market the Xerox-Interlisp D system (known as EMS at Siemens). Digital Equipment Corporation (DEC) is also increasing its efforts and is trying to gain a foothold in the market, particularly through their proposal for large-scale training on AI stations.

In the software field, the market remains very diverse: Many companies still see a chance to succeed here by developing specific products. They are led by Nixdorf, which identified needs early on and developed the expert system shell, sold under the name TWAICE, which is modeled on the PROLOG-based EMYCIN-Paradigma. Inter-Face Computer GmbH, founded in Munich in 1982, has developed a PROLOG version called IF-PROLOG, which can be very easily installed on various UNIX computers because it is written in C. The EPSILON company of Berlin, which developed and distributes the MPROLOG variant, is also interested in using PROLOG. A few new companies are trying to gain a foothold in the existing expert systems market either by using purchased software (for example, Brainware GmbH, Wiesbaden, with smaller shells for PC's) or by offering services and training in the field of knowledge engineering (for example, Expertise in Berlin, or Insiders in Mainz).

In recent years, Siemens AG has also made considerable efforts and developed this area intensively as part of its primary technological activity. The first application-oriented result is a configurator called SICONFEX for the operating systems of process computers distributed by Siemens.

BP's SCS subsidiary in Hamburg also has an important knowledge engineering group. This software house is active in the ESPRIT project, as are other companies mentioned above.

GMD Expert Systems

The GMD Society has worked in expert systems since the early 1980's. In 1983 it created an "Expert Systems" research group at the Institute of Applied Data Technology. As a member of an organization whose work extends from the scholarly fundamental research of universities to industrial development, this research group has set as its goal the development of an advanced general-purpose expert systems technology. To this end the company works basically in the fields of "software and methods" and "knowledge engineering." The above-mentioned DEX.C3 expert system was created by the "knowledge engineering" working group. Spanning these two fundamental fields, the research group has created a small sphere of innovation extending from the foundations of artificial intelligence and cognitive psychology to purely practical applications. The already developed Babylon system serves as catalyst for this research. It provides a state-of-the-art tool system to knowledge engineering specialists and is the object of on-going development based on current research findings and feedback from a series of practical applications. Roughly speaking, this Babylon system includes:

--the formalisms currently used for representing knowledge (logic, frames, rules) with the associated inference technologies,

--aids for managing scientific bases,

--preestablished dialogue procedures for consulting data in conversational mode during the inference process,

--preestablished explanation mechanisms for conclusions drawn during the inference process.

The system runs on Symbolics-Lisp machines and permits access to the basic Zeta-Lisp language. Compared to other systems developed in the United States which have now appeared on the market (KEE, Art, Knowledge Craft, or SI), the Babylon system is characterized by its special architecture, in particular by the way it integrates the various formalisms for representing knowledge ("distributed problem solving" architecture). This architecture renders the system open to any subsequent upgrades and expansions. During Beta testing it has been largely absent from industry for a year, with an average of 19 different users, including INPRO, as well as one installation in the Netherlands and another in Japan. Moreover there are many instances of cooperation in research, including in the special research field 413, "Artificial Intelligence," set up by the German Research Association at the Saarbruecken, Kaiserslautern, and Karlsruhe universities. There is cooperation with Saarbruecken University, where natural language access procedures to expert systems are being developed.

The Babylon system provides the fundamental tools for two joint projects undertaken by the BMFT in the field of knowledge processing (the TEX-1 and WEREX projects). The goal of the WEREX project is to provide a tool system similar to the Babylon system for general-purpose computers, i.e., MS-DOS and UNIX computer systems. The French INRIA's [National Institute for Data Processing and Automation Research] LeLisp, initially developed around language structures oriented toward application goals, is used as the basic implementation language.

BMFT Research Support

A whole series of master R&D projects in knowledge processing and expert systems was created last year with BMFT subsidies. These are long-term projects, each involving several industrial participants working in close cooperation with research institutes.

The project will continue through 1988-1989. BMFT subsidies granted for these projects thus far total DM121 million (including image and language processing).

In the field of knowledge processing efforts focus on fundamental work on the development of expert systems, pattern recognition, recognition and processing of spoken languages, and analysis and interpretation of sensor and image data. In all projects, not only are basic concepts defined, but the validity of solutions is also tested through sample prototype applications.

In this respect, a BMFT press release states:

"All these study topics, drawn up in basic discussions with scientists from research and industry, include first the preliminary definition phases and then the essential questions of this new branch of science, which is now being developed throughout the world, constituting great progress on the road to fifth-generation computers."

The attached table lists BMFT-subsidized projects in the field of knowledge processing and, where science-based methods are used, that of pattern recognition. (It should be noted that all the projects combined exceed the amount of the subsidies because the BMFT subsidizes only 50 to 75 percent of expenditures.)

Table 1. Knowledge Processing/Expert Systems

Project	Participants	Duration	Subsidy (millions)
Knowledge acquisition and research on use of expert systems for a fee (LERNER)	Nixdorf AG, Stollmann GmbH, Berlin TU [Technical University]	1985-1988	DM6.5
Knowledge representation and reasoning procedure for physicotechnical systems as a unified base for technical expert systems (TEX-B)	FhG [Frauenhofer Society]-IITB, Batelle Institut, PCS GmbH, GMD, Siemens AG	1985-1989	DM8.8
Technical expert systems for interpretation of data, diagnostics, and process control (TEX-1)	Siemens AG, Bayer AG, ESGmbH, Krupp Atlas, Elektronik GmnHJ, FhG, IITB, GMD	1985-1988	DM10.4
PLAKON: expert system-basic core for planning and configuration functions (TEX-K, in preparation)	Philips GmbH, Batelle-Institut, Siemens AG, URW GmbH, Hamburg University	1986-1989	not yet announced
Coordinated system of tools for design and use of expert systems (WEREX)	GMD,ADV/ORGA Fa. Meyer AG, Danet GmbH, PCS GmbH, Siemens AG, Erlangen University, Munich University	1985-1989	DM10.2
Knowledge-based advisory dialogue (WISBER)	Saarbruecken University, Nixdorf AG, SCS Orbit GmbH, Siemens AG, Hamburg University	1985-1988	DM10.1
Knowledge-based systems for office communication: document handling, organization, man-machine communication, (WISDOM)	Triumph-Adler AG, FhG-IAO, GEI Systemtechnik, GMD, Munich TU, Stuttgart University	1984-1988	DM25.2

Table 2. Pattern Recognition: Image and Language Processing

Project	Participants	Duration	Subsidy (millions)
Self-contained mobile systems	Daimler Benz AG, Stuttgart University, Carl Schenck AG, FhG-IITB, Bundeswehr University	1985-1989	DM4.8
Document Analysis	AEG-Telefunken Kommunikationstechnik AG, Siemens AG, Philips Kommunikations Industrie AG, Rhine-Westphalia Technical University Aachen	1985-1988	DM14.5
Multisensor system for interpreting industrial situations: --Multi-level intersensory image processing --Machine control by means of acquired-knowledge-based diagnostics	FhG-IITB, AEG-Telefunken Anlagentechnik AG, Kontron Bildanalyse GmbH, Philips GmbH, Siemens AG, Signum Computer GmbH, Carl Zeiss, Daimler Benz AG, Gebr. Heller GmbH, Interatom GmbH, Krupp Atlas Elektronik GmbH, Stuttgart University, Muenster University, Munich TU, FhG, Karslruhe University	1985-1988	DM20.2
Language recognition: man-machine dialogue with recognition of continuous speech	Siemens AG, Philips Kommunikations Industrie AG, AEG-Telefunken Anlagentechnik AG, Berlin TU, Erlangen University	1984-1989	DM10.2

25053/8309
CSO: 3698/A068

WORLD'S FIRST STAR STRUCTURE OPTICAL LAN USED IN STUTTGART

Stuttgart DIE COMPUTER ZEITUNG in German 15 Oct 86 p 34

[Article by Dr Lothar Ulsamer: "Possible Uses of Optical High-Speed LAN's: Data Exchange Using Light"]

[Text] The Hirschmann company installed the world's first optical LAN (local area network) with active star connections at the University of Stuttgart. It has operated error-free ever since--convincing proof that optical transmission technology is fully operative.

This optical LAN corresponds to international IEEE Standard 802.3 and permits problem-free exchanges of data between the central large-scale computer and the terminal equipment, as well as interference-free communication between computers. In the meantime, other optical networks of this type have been installed in the FRG as well as in other countries.

In principle, this optical LAN is based on a star-shaped network structure--its nodes contain active star connections which act as a trunk interface for the optical terminal equipment lines or the optical trunk lines to the points on the star. Full use is made of the advantages of optical data transmission:

--absolute immunity to interference from electromagnetic fields;
--complete electrical isolation of transmitter and receiver;
--extremely high transmission capacity;
--largely secure;
--low cable weight, small cable cross-section;
--minimal attenuation;
--absolutely no problems with regard to potential;
--no risks in areas where explosion hazard exists;
--significant cost advantages;
--unlimited material availability.

For the connection of partial networks using conventional coaxial technology, a coaxial adapter card was developed for insertion into the active star connections. It contains two Type N coaxial jacks for connecting one or two Ethernet or Cheapernet cables. Collision detection, data reception and power supply are indicated by LED's--the maximum total cable length attached to the N-jacks is 500 meters for Ethernet and 200 meters for Cheapernet applications.

Since optical transmission technology offers significant advantages over conventional transmission methods, it provides the optimum system solution in the following areas: exchanges of data between computers of all sizes, analog and digital transmission of test values, industrial machine control applications, uses in the chemical industry, in monitoring systems or in medical technology.

The installation and successful use of an optical high-speed LAN at the Karlsruhe Nuclear Research Center, for example, provides proof that optical-based local area networks can always handle even the most extreme conditions. This optical LAN from Hirschmann for the first time permits networking among various computers in the cyclotron, thus making automatic control possible. In addition, this LAN currently connects the cyclotron, the main data processing and instrumentation department (HDI), and the Institute for Data Processing in Technology (IDT), with the Institute for Neutron Physics and Reactor Technology (INR).

As already indicated, active star connections are installed in the nodes of the star-shaped LAN. The overall network, with a range of up to 4500 meters (coaxial systems permit a maximum of only 2500 meters), can include 38 points on the star: four star points can be linked in a cascade connection in a virtual circuit. The optical waveguides coming together at each of the star connections are bunched and the information is further transmitted via an inexpensive two-fiber optical waveguide connection.

Each of the active star connections is located in a 19-inch housing and allows the connection of up to 19 branches. The signals received at the inlet gate are prepared such that they are once again available at full transmission power for distribution to all output gates. An optical adapter card need only be inserted into the star connection for each of these branches.

Individual rooms or even building complexes are connected via the branches going out from the star connections; the terminal device in each case is connected to the nearest star connection via an optical transceiver. Using a combination of transceiver and interface expander, up to eight terminal devices can be connected. If the terminal equipment within one area is already interconnected using coaxial cable, central integration into the optical network can also be achieved by means of a duplexer.

In addition to economical price and noise immunity, particular requirements for the use of an optical LAN at the Nuclear Research Center were also daily availability of the transmission system and flexibility of installation. Within the cyclotron, which among other things produces short-lived radioisotopes for medical purposes, substantial electromagnetic interference fields, strong radio-frequency fields and extreme switching peaks in the electrical network occur--factors which prevent the use of conventional coaxial technology for data transmission.

At the present time the optical LAN at the Nuclear Research Center has a total of four star connections. Decentralized local area networks--using coaxial copper wire, assisted by optical waveguides or in combination--are connected to a central optical LAN (backbone) via gateways. Since optical waveguides

can be laid parallel to high-voltage cables on the same cable platforms or in the same conduits, numerous structural considerations which would have to be taken into account when installing heavier and more interference-prone copper cable would no longer apply.

Likewise crucial to the construction of a central optical LAN at the Nuclear Research Center was the fact that networks with different data protocols could be connected using appropriate equipment such as gateways and bridges.

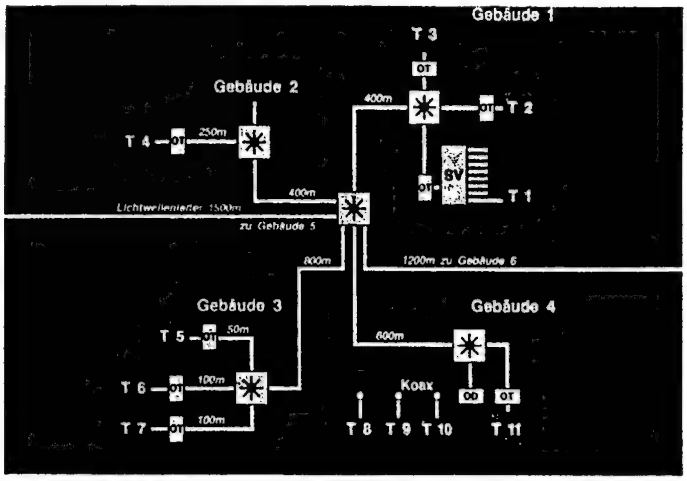


Fig. 1 Block Diagram of an Active Optical Star-Shaped LAN:

Key:
- Gebaeude = building
- zu Gebaeude = to building
- Lichtwellenleiter = optical waveguide
- Koax = coaxial cable
- SV = interface expander
- Tn = terminal equipment
- OT = optical transceiver
- OD = optical duplexer

12552
CSO: 3698/240

PHILIPS THIRD-QUARTER PROFITS LOWER THAN EXPECTED

Amsterdam COMPUTABLE in Dutch 14 Nov 86 p 34

[Unattributed article: "Philips 3d-Quarter Profits Disappointing"]

[Text] Amsterdam--Philips' [1986] 3d-quarter financial results were 27 percent below those of the same period last year. The strong position of the Netherlands guilder on the international market is one of the reasons for this set-back.

These 3d-quarter figures made Philips reconsider previous forecasts that this year's profits would be higher than last year's. The 7-percent growth rate in revenues will apparently not be reached, and Philips has now set a 5-percent target instead. "It will be difficult to obtain the same net results as last year," said a Philips spokesman. The 1985 net revenues amounted to 919 million guilders, whereas current net profits have dropped by 22 percent to 479 million guilders over the first 9 months. Over the same 9-month period turnover went down by 9 percent to 39.08 billion guilders.

The 3d-quarter figures are: 127 million guilders in net profits (175 million in the same quarter of 1985) and a 12-percent reduction in turhover to 12.7 billion guilders. Philips' Robert Spinosa Cattela says: "We expected the 2d-quarter results, which were better than last year's, to continue in the 3d quarter."

The biggest blows have hit Philips in export markets, in part because of U.S. companies. Spinosa Cattela said that if we ignored exchange losses, there would indeed have been profits. The electronics sector did yield profits this year, whereas it still suffered losses last year.

Spinosa Cattela did not want to quote figures as yet.

Although Philips expected its North American Signetics subsidiary to make profits this year, this does not seem to be the case. However, losses are less drastic than last year: about $20 million now (27 [as published] million guilders) versus $80 million last year (185 million guilders). As for 1987, the spokesman added: "It could not be worse than in 1986."

25048/9835
CSO: 3698/A064

BRIEFS

PHILIPS-SIEMENS COOPERATION CONTINUES--Munich--Philips and Siemens intend to renew cooperation on the development of future generations of chips, although not on the same scale as the Megaproject. What such cooperation will involve is still unknown. Negotiations are currently underway. Continuing cooperation between the companies was announced in the NRC HANDELSBLAD by Dr H. Franz, Siemens vice president and head of the components division. Philips will refrain from further announcements until a press conference on the Megaproject--the development of submicron chip technology. The possible new cooperation will be different from the Megaproject, according to Franz. The Megaproject was set up to catch up from behind. He added that once both companies master the submicron chip technology, it will be much more difficult to find key products with interchangeable technologies. New cooperation will therefore probably focus on sub-areas such as lithography and etching. In addition, both companies may combine efforts to develop production automation equipment. Meanwhile, Siemens, Philips, Telefunken, and the German company Leybold/Heraeus have established COSY [Compact Storage Ring for Synchrotron Radiation] Microtec, a company that will build a synchrotron for X-ray lithography. They are also thinking of jointly designing 16-megabit dynamic memories or chips of comparable complexity. These should be available by 1992. [Text] [Amsterdam COMPUTABLE in Dutch 14 Nov 86 p 30] 25048/9835

CSO: 3698/A064

SALES, USE OF ROBOTS IN BELGIUM

Borgerhout RADIO REVUE in French Aug 86 pp 5-8

[Series of articles: "ISIR Robotex: Robotics, Automation"; RADIO REVUE is a publication of the Interuniversity Microelectronics Center]

[Excerpts] Robots in Belgium

A 1985 study by the Belgian Robotics and Automation Institute [IBRA] shows that robot sales were declining in spite of the boom in the automobile industry.

This trend seems to be confirmed in 1986.

To correct this decline, two courses of action are possible:

--Involving other industrial sectors by providing information;

--Focusing efforts centered on a second generation of robots.

The number of companies producing robots is declining. Whereas there were originally 40 firms selling robots, there were only 12 left in 1986. In all likelihood, only these 12 will remain active.

Of the total number of robots sold in 1986, the lion's share, or 137, are for the automobile industry.

The following table shows the number of robots sold in Belgium:

Robots		78	79	80	81	82	83	84	85
Annual Sales		9	9	28	184	119	153	262	186
Total Installed Base	12	21	30	58	242	381	514	775	961

(Footnote) (1984 data is not completely accurate because one company confused the number of "robots sold" with "robots installed.")

The table below gives the numbers of robots per industrial sector:

Sector	Quantity	%
Auto	638	66.5
Mechanical Engineering	96	10
Synthetic Products	21	2
Electronics	16	1.5
Foundries	15	1.5
Education	108	11.5
Other	67	7

Despite interest from other sectors, it is surprising to note that the largest number of robots is used for spot welding in the automobile industry.

Below are the numbers of robots used in Belgium, divided by application:

Application	Quantity	%
Feeding materials to machines	84	9
Spot welding	547	57
Arc welding	84	9
Cleanup	7	1
Painting	26	3
Processing	21	2
Assembly	5	0.5
Education	109	11.5
Other	78	8

Most of these robots, 60 percent of the total, are made in Europe. It is surprising that the number of Japanese robots is so limited given the large amount of robot manufacturing in that country.

In 1985, as in 1984, five companies manufactured 77 percent of the robots.

The following table shows the origin of robots installed in Belgium.

Origin	End 1984 %	Robots 1985	End 1985 %
Europe	48	170	56
USA	41	15	35
Japan	11	1	9

Available data indicate that the leading automobile manufacturers have reached a saturation point, and that we can expect a slight decline. The next few years will be crucial for the robotics industry, both for manufacturers and for designers. A major effort will be needed to incite Europe's conservative industry to embrace increased robot automation in order to maintain its market share.

25051/9738
CSO: 3698/A029

ITMI OF FRANCE DEVELOPS AI, MACHINE VISION ROBOTICS

Paris ZERO UN INFORMATIQUE in French 15 Sep 86 pp 127-129

[Article by Marc Ferretti: "ITMI: Making Machines Intelligent"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Excerpts] Robotics, vision, and artificial intelligence [AI]--These are the domain of the Grenoble company ITMI [Industry and Technology of Intelligent Machines]. High technology, certainly, but designed to satisfy manufacturers' practical requirements. And a small company that must grow quickly to live up to its ambitions.

Grenoble: Its emblem features three roses symbolizing tourism, of course, but also the university and industry. Grenoble's ZIRST [Zone for Scientific and Technical Innovation and Products], very near the city (in the suburb of Meylan) is the French Silicon Valley, with a team of some 50 AI experts working at ITMI.

ITMI employs 63 people living in the heart of this industrial zone of Grenoble. The company was established 4 years ago by men with very different backgrounds, including academia (Jean-Claude Lacombe, today ITMI's president), research (Jean-Francois Miribel, now involved in image processing at another ZIRST company, Getris), robotics (Pierre Montarquet), and industry (Gerard Mezin). These men all shared a common desire to produce intelligent machines.

"Like man who perceives his environment, understands what is going on, and then acts--we decided to concentrate on the three areas which correspond to these human functions: vision, artificial intelligence, and robotics," explains Eric V. David, head of marketing and techno-activities. Thus, the firm is based on three product families: the GTR (Real-Time Gradient) specialized processor, capable of collecting visual data under virtually any lighting conditions, even in dimly or poorly lit environments; Planex (activity planning, resource allocation) and Pilotex (control and maintenance of industrial processes) expert system cores; and finally, the LM high-level programming language, in which every command describes only the final result of a specified task and consequently represents a complex action.

"The founders and staff hold almost 60 percent of our present capital of only Fr 6.3 million," adds E.V. David, "with the balance equally shared by Hewlett-Packard; BNP [National Bank of Paris], which will support us until the company

is listed on the stock exchange; and for the last year or so, Pechiney. Other firms will undoubtedly provide the additional funding essential to our development. Our company's survival is at stake."

Overtures are being made in all directions: Although its head office is in Grenoble, ITMI has opened a technical unit in Paris and a subsidiary in Boston. It has found a representative in Singapore for all of Southeast Asia. It sells (a little) in Japan through Mitsubishi, and, last of all, it is installing its European network--in Benelux via Distribel, and soon in the FRG, in Italy, and in Spain....

Obviously, such a high tech company is also approaching universities: Grenoble, of course, but also Lille, Rennes, Toulouse, Bordeaux, Orsay, etc. Abroad, contacts are being pursued with Stanford, MIT, Carnegie Mellon University, Montreal Polytechnic Institute... in short, the cradles of artificial intelligence.

Half of ITMI's turnover comes from industry, the other half from military applications and large-scale programs such as ESPRIT and EUREKA.

LM for Robotics: Imitated But Unequaled

LM is the high-level language derived from Pascal, selected for programming the Scemi, Commercy, Acma, and Citroen Industrie robots, and used by another small company located in the ZIRST: AID (Dauphine Industrial Assistance). Together with this company ITMI has set out to conquer educational robotics. This ITMI-AID cooperation could eventually result in a joint subsidiary specializing in the development of didactic aids for teaching robotics.

Num SA (a Telemecanique subsidiary), the French leader in computerized digital control, has begun to diversify into robotics with its Robonum line. Num and ITMI have signed an agreement to integrate the LM language in the Robonum 800.

LM has also been selected as the programming language of the French ARA project for advanced robotics.

In artificial vision, ITMI has developed and produced a specialized, hardwired image processor, based on work by Imag. This GTR processor handles all points of an image uniformly and extracts its contours regardless of lighting conditions. Contour extractions are performed in real time, 50 times per second.

Two types of expert system cores are already available: Pilotex, designed to control industrial processes where time is a determining factor (evolutionary process control, alarm processing, diagnostics); and Planex, for activity planning and resource allocation (production schedules, factory routing, and project and equipment management). Soon to be added is Diagnex, a natural offshoot of Pilotex, now nearing completion. Process and machine diagnostics and predictive maintance will be the fucntions of this expert system expected last this year.

ITMI is also becoming interested in intelligent CAD [Computer Aided Design] where the input is the user specifications and the output is the gradually refined form of the object being developed.

ITMI Can Point to Three Successful Applications of Its Pilotex Process Control System

At Pechiney, ITMI has developed an expert system for the control of electrolytic aluminum refining. For the AEC [Atomic Energy Commission], ITMI has installed Pilotex to control the heat exchange between sodium and water and to control the alarms. Finally, an expert systems protocol has been developed for controlling warships to ensure threat evaluation and real-time assignment of weapons systems for response in case of attack. The French Navy is currently experimenting with this system.

Planex, too, has been successfully applied. By Elf-Aquitaine, for example, in organizing its fleet of oil rigs and in optimizing rig movement on the basis of a multifactorial analysis, including the avoidance of certain zones, if desired. Together with the CAM-I international organization, ITMI has developed a system (directly in English) for preparing production schedules. Also noteworthy are the expert system used by Total for the study of new chemical molecules and the training system developed for Avions Marcel Dassault (automatic acquisition of new knowledge by an expert system).

"We are witnessing an explosion of ideas," concludes E.V. David. First to set up diagnostic tools, then to integrate expert systems, robots, and vision systems. We have reached a point where we can consider diversifying the tools of data acquisition: load sensors to pilot robots and--why not--voice recognition, which ITMI may one day develop. But this is for after the long-awaited capital increase.

20546/12232
CSO: 3698/A005

FRG STANDARDS INSTITUTE DEVELOPS CAD SPECIFICATIONS SYSTEM

Duesseldorf VDI NACHRICHTEN in German No 42, 17 Oct 86 p 43

[Article by Prof Dr von Claus Reuber: "Design Standards on Magnetic Tape--DIN Develops CAD Data File for Stnndard Components;" first paragraph is VDI NACHRICHTEN introduction]

[Excerpts] VDI-N, Verlin, 17 Oct 86--With the creation of a computer file for CAD standards, that is, the transfer of DIN standards to machine-readable media, the German Institute for Standardization (DIN) has broekn new ground. In the DM 15 million project, standard components are described in the programming language Fortran 77 and delivered to manufacturers of CAD systems on magnetic tape. The manufacturers can then insert the standard component programs into their system architecture so that eventually users need purchsse and service a CAD standard file only.

About 350 experts gathered in Berlin on 16 September to get information on the status of work for elaboration of the CAD standard components file at DIN, and to discuss its progress. In his opening remarks, Dr K.G. Krieg, Eng., from DIN recalled the start of the project more than 2 years ago and the fact that eight other nations are participating in addition to the German standardization committees [NSM's]. The purpose of the project is to transfer DIN standards written on paper to machine-readable media, which means breaking new ground in every way.

DIN will be able to offer the first standards in the form of system neutral data by the beginning of 1987. However, Kreig also noted that financing for the DM15 million project is not guaranteed to be sufficient because, in the future, DIN will examine its entire compilation of standards in terms of its suitability for use in computer aided techniques.

Dr W. Pletschen, Eng., of the Standardization Panel for Factual Characteristics (NSM Group 4), discussed the current status of the project. This working group was established 20 months ago and created 13 sub-groups in accordance with priorities, starting with "general definition" and continuing on to single standard components (screws, nuts, pins, bolts, threaded pipe joints, condensers, cable terminations, formed pipeline parts, and roller bearings), as well as graphic and circuit symbols, formed elements, and semi-finished

goods all the way to entire systems and even to a working group on "marketing law." Up to now, the working group NSM 4 has been able to present a directive for the compilation of pre-standards and a recommendation for DIN management concerning the marketing of the standard file for CAD.

The pre-standards are planned to be transformed by DIN or DIN representatives into specifications files. The NSM 4 carefully coordinates this with the NAM 96.4 panel for mechanical engineering standards and the Association of the German Automobile Industry. The necessary subprograms for standard components are to be delivered on tape to CAD system manufacturers together with the specifications files as software for CAD component standards.

Regarding the utilization of the CAD standards file, Dr H. Seeland, Eng., chairman of the relevant working group, said that the individual development steps should enable it to guide the user interactively in selecting a standard component on the screen by using the number of the standard specification card, through text retrieval, as well as through symbolic tables of subassemblies. This includes the choice of display of text or tables with graphics, choice of variants through the selection of listed values, as well as barring and identifying values which are not authorized in industrial specifications.

The individual regulations include the types of geometric representation: bidimensional geometry with points and edges, or tridimensional wiring geometry elements as well as physical elements and related operations. According to Seeland, the decision to use the Fortran language brings a number of advantages, including the use of an already standardized programming language with available development tools as well as the fact that many CAD/CAM systems already have Fortran interfaces, and that most are compiler accessible for fast processing.

8617/9738
CSO: 3698/M067

FRENCH SENSOR MANUFACTURER EYES WORLD MARKET

Paris L'USINE NOUVELLE in French 25 Sep 86 p 54

[Article by Laurence Martin: "Sensors for the Iron and Steel Industry: Top French Firm Out To Win World Market"; first paragraph is L'USINE NOUVELLE introduction]

[Text] SERT, a Lyon-based 20-man firm is waging a dual offensive in sales and in technology, and it expects to double its revenues over the next 10 years.

SERT (Lyon Technological Research and Development Company), a firm which specializes in the design and manufacture of sensors for the iron and steel industry and has nearly total coverage of the French market, is currently making inroads in Asia. The firm's dynamic growth is illustrated by the increase in its turnover from Fr 3 million in 1983 to Fr 7.5 million in 1985, including 70 percent from export.

From its origins selling products based on patents developed by Pierre Poncet's design office, SERT went on to specialize in sensors as a result of the interest that its founder, Pierre Poncet, had in the steel industry during the 1950's.

Diversification To Counter Production Cutbacks

Once it dominated the domestic market, the company had to promote sales in countries where steel production is climbing dramatically, specifically in Southeast Asia. SERT's 1985 contract with the Japanese Nissho-Iwai firm opened the door to dealings with customers such as Sumitomo, Mitsubishi, and Nippon Steel. Through Hissho-Iwai's representatives, the agreement inserts SERT into the Australian and North American markets.

China, the world's fourth largest steel producer, is another expanding market eyed by SERT. "We are about to receive orders from a market which accounts for 50 percent of world requirements in steel-producing equipment," believes Frank Montegu, the engineer in charge of sales policy.

This is not merely a sales campaign but a technological one as well. Through the 1985 purchase of Werner Keim's patent for a third-generation pulse laser optical sensor, Franck Montegu intends to "lock up the market." The move cost Fr 1.4 million, "but it makes us the only company able to replace all the first- and second-general optical sensors."

Expecting a cutback in world production capacity, SERT has pursued diversification for several years. In addition to the sale of sensors (75 percent of turnover), it develops and supplies steel producers with the actuators and regulators used in continuous casting control systems.

It has also recently designed an automatic steel covering powder distributor. "A product which should play as important a role as the sensor in the automation of the steel industry. We are also moving in on nonferrous industries such as brass, copper, and even glass," states Benoit Dupuich, technical director.

Four sensors have been sold this year to the Trefimetaux company's Pont-de-Cheruy and Bois-Thorel plants. In preparation for this new market the company is beefing up its sales department and is forecasting a 1986 turnover of Fr 8.5 million. "While remaining cautious, we expect to be able to double this figure over the next 10 years," according to Benoit Dupuich.

25050/9738
CSO: 3698/A021

BMFT ANNOUNCES CONDITIONS FOR LASER PROJECT PARTICIPATION

Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN in German No 438, 28 Aug 86 pp 7-8

["Notice of the Federal Minister for Research and Technology Concerning the Support of Joint Projects Within the Framework of the Priority Program Laser Technology;" dated 7 August 1986]

[Text] 1. The priority "Laser Technology" program of the Federal Ministry for Research and Technology (BMFT) provides for support of joint projects to resolve problems that are beyond the scope of companies and are oriented toward the future within the framework of the methodologies applied in laser treatment of materials. Support is extended to those research and development projects that are characterized by high development risks, unusual complexity, and high overall expenses, and that require multidisciplinary approaches and must be resolved jointly through division of labor among companies and research institutes.

Herewith, the BMFT announces the support for the following joint project:

"Cutting with high performance CO_2 lasers"

The subject of the priority project is to be the development of methods for laser cutting of metals and nonmetals using CO_2 lasers with a power range of from 1 to 10 kw. The following R&D work, in particular, will be promoted:

--research on processes for the cutting of steels with a minimum thickness of approximately 10 mm as well as nonferrous metals (for example, aluminum) of various thicknesses;

--research on processes for the cutting of new materials such as fiber composites and ceramics;

--research on effects which cause considerable problems during the subsequent processing (for example, oxide coatings, whisker formation, etc.);

--aspects of materials technology, process diagnostics, quality criteria, and quality control;

--development of a model for the understanding of the quantative relations between laser parameters and cutting results as well as techno-procedural tasks for the interaction of the beam source and the material;

--study of R&D aspects of norms and standards.

The development of necessary components, for example, focusing optics, gas nozzles, etc., can also be provided for during the definition of the individual assignments.

The development of equipment, systems, and projects which represent the state of the art as well as individual product-specific applications are not subsidized.

As fundamental goal of the project is the publication of the results of these activities in a manual in a form which can be used by industry. Data must be made compatible with possible electronic publishing.

3. Manufacturers and users of lasers as well as research institutes are invited to cooperate actively and/or informally.

Given particular consideration are those proposals that already include concrete ideas for cooperation of enterprises and institutes (for example, FhG [Fraunhofer Society], MPG [Max Planck Society], and universities). Participants must define project management in accordance with the project contractor VDI (Association of German Engineers) Technology Center before approval is granted.

4. The BMFT is subsidizing the joint project based on available budgetary funds. As a rule, 50-percent self-financing from commercial firms is a prerequisite for subsidy. As for the expenses of institutes, as a rule, industrial participation of 25 percent is necessary, to be paid in the form of a financial contribution, but it can also be furnished in the form of payments in kind (for example, provision of special operational resources, materials).

The respective BMFT control principles are taken as the basis. No legal claim to subsidies exists.

5. Proposals concerning the execution of the above-mentioned research and development projects, which initially are to be presented only in the form of a short description (indicating, in particular, the subject of the partial project), goals, work and time schedule, financing requirements, participants), must be submitted to the project contractor: VDI Technology Center, Physical Technology, Graf-Recke-Str. 84, 4000 Duesseldorf 1, by 30 September 1986.

6. Further information about this joint project, and especially documentation about the subsidy, can be obtained from the project contractor, VDI Technology Center, Technology Center,

Contact: Dr Stahl

Telephone: 02 11/62 14-592.

Bonn, 7 August 1986

[Signed] The Federal Minister for Research and Technology

by
Dr Roehrig

8629/9738
CSO: 3698/M028

BRIEFS

BIOSENSOR RESEARCH IN FRANCE--France, like the UK, has established a national program to strengthen university research in biotechnology and to promote the efficient marketing of research findings. A Biology and Medical Engineering Club has been established under the auspices of the CNRS [National Center for Scientific Research] Industrial Liaison Committee. Approximately 40 university and industrial organizations are members of this club. Among them, the Paris Ecole Superieure of Physics and Chemistry takes an interest in the technology of ISFET's (ionoselective field effect transistors, which use permeable membranes penetrable only by certain types of ions), and GASFET's (which are sensitive to certain gases). In its section No 7, INSERM [National Institute for Health and Medical Research] is studying the mechanism of hormone activity in both biochemistry and pharmacology. It is also interested in monitoring systems. At the UTC [Technological University of Compiegne] research focuses on fixed enzyme systems, reactor kinetics, and enzyme electrodes. [Excerpt] [Paris L'USINE NOUVELLE (PRODUIRE Supplement to No 46) in French 13 Nov 86 pp 112-114] 25046/13046

CSO: 3698/A074

PHILIPS OPENS LCD PLANT IN NETHERLANDS

Rotterdam NRC HANDELSBLAD in Dutch 20 Nov 86 p 13

[Article by Pieter Graf: "Liquid Crystal Technology Is of Strategic Importance; Philips Opening LCD Plant"]

[Excerpts] Heerlen, 20 Nov--Today Philips opened a plant in Heerlen for the manufacture of liquid crystal displays (LCD's). Over 150 million guilders have been invested in this plant. By mid-1987 this plant will employ some 250 people.

The overall world market for liquid crystals currently reaches some 1.5 billion guilders. They are used primarily for the numbers for digital pocket calculators and watches. Sales are expected to reach some 10 billion guilders within 5 years. Han Quaadgras, manager of the LCD plant and responsible for technical supervision: "We are aiming at a 10-percent share of the world market."

Philips took its first steps in LCD technology in the early 1970's. Basic research was conducted in its own laboratories in Eindhoven, in Redhill in England, and Briar Cliff in New York State. Since 1973, Philips has developed LCD's for industrial and professional applications in its French development center in Caen.

In the mid-1960's the American RCA company started experiments which eventually resulted in liquid crystals. RCA, however, withdrew from this technology, which was taken up by the Swiss electronics company Brown Boveri, among others, in close cooperation with the large pharmaceutical concern Hoffman La Roche, and by the Japanese electronics company Sharp. In 1973 Sharp marketed the first pocket calculator with an LC display.

After some years of working on liquid crystals by itself, Philips decided to cooperate with Brown Boveri in 1979. Videlec, a joint venture for the development and production of LCD's, was created in Lenzburg, Switzerland. Later on Videlec opened a production plant (250 people) in Hong Kong.

Initially, Philips and Brown Boveri owned an equal share of Videlec, but in 1984 Philips acquired the shares of its Swiss partner. Shortly afterwards

Videlec's activities were transferred to the Netherlands. Quaadgras says: "Brown Boveri started this at a time when the watch industry was disappearing in Switzerland. They came to the conclusion that this activity did not really fit into their major activities, whereas Philips began considering it as a strategic activity. Therefore we took over Videlec completely."

The involvement of Hoffman La Roche has always been crucial for the manufacture of liquid crystals. Quaadgras: "The molecules involved are very difficult to produce. One kilogram costs 10,000 guilders. Only a few pharmaceutical companies worldwide are capable of producing liquid crystals. Besides Roche there are, for example, Merck and British Drug House. There is one liquid crystal manufacturer in Japan, but Japanese companies such as Sharp, Hitachi, Epson, and Optrex mostly buy in Europe because quality is better."

The ultramodern LCD production line which Philips built in Heerlen comes from Japan. It was entirely supplied by Sharp, together with a 3-year contract for knowledge transfer on production techniques. Quaadgras says: "You do not just buy machines. The Japanese are ahead in production technology. They started earlier. They were the first to mass-produce LCD's for pocket calculators and watches."

The question remains whether the Japanese will not keep a substantial advance in this field, if only because they are already marketing very small televisions using liquid crystals instead of conventional cathode tubes. According to Quaadgras, this is not necessarily the case: "The Japanese are already producing those things, even though they are still far from perfect. We Europeans have a different approach. We fully test a product in the laboratory before launching it on the market."

Expertise in Mixing

The crystals are supplied by the pharmaceutical industry; production equipment comes from Japan. So what remains for Philips? Quaadgrass: "There are different liquids from various manufacturers. Liquid crystals alone are not enough. It is, for example, necessary to add an antioxidant liquid. In the beginning, for instance, you could buy an LCD watch whose display was no longer readable 2 years later."

Temperature control is also very important because LC's only keep their characteristics at a certain temperature, while contrast is very important for visibility. Quaadgras: "Know-how to a large extent consists in mixing all these liquids and that is something we are doing ourselves. We are constantly examining how different liquids interreact."

[Marketing manager] Rijsdijk and Quaadgras are unwilling to say how much Philips paid for the complete Videlec buy-out and for the acquisition of the machinery from Sharp, nor will they disclose how much Philips plans to invest

in LCD technology in the years to come. Quaadgras: "This technology is of crucial importance for future display technologies. We cannot afford to sit idle in this field. It is of strategic importance to Philips. So you can assume that the budget for the further development of this technology will be sufficient.

25006/9835
CSO: 3698/A065

ES2: AIMS TO MASS PRODUCE INTEGRATED CIRCUIT DESIGN

Brussels INDUSTRIE MAGAZINE in French Oct 86 pp 114-119

[Article by Marcel Miller: "Silicon Compilers"; first paragraph is INDUSTRIE MAGAZINE introduction]

[Excerpts] United against Japanese and American competition, the big names in European electronics decided to finance the creation of the European Silicon Structures (ES2) company for the development of silicon compilers. The Societe de Microelectronique [SDM] (Loverval) is participating in the project.

Low-Cost Design

The ES2 company, founded in late 1985, is multinational and European in regard to both its shareholders and its activities. It was established by private capital investments drawn primarily from the big names in European electronics and computer technology (Bull, Philips, Olivetti, British Aerospace, Brown Boveri, Telefonica,...), and has offices in three European countries: France, the FRG, and the UK. In addition, an extensive network of design centers is in place throughout Europe in order to decentralize design processes, moving them nearer the end user.

The creation of ES2 comes at a moment when microelectronic techniques for both design and manufacturing have been so highly developed that ASIC [Application Specific Integrated Circuit] design is within the reach of any electronic systems design engineer. Use of ASIC will soon be a requirement for any systems manufacturer who wants to increase the performance and competitiveness of his products.

The idea behind ES2 is the large-scale distribution of low-cost design tools which will allow more electronics engineers to design their own integrated circuits. This is the same idea as led to the proliferation of the MDS (Microprocessor Development Systems), enabling thousands of electronics engineers to design their own microprocessor systems.

In contrast to the more conventional approach, ES2 is structured for the mass production of designs rather than products. ES2 is banking on two fundamental assets. At the design level, workstations with powerful silicon compilers provide systems engineers with a low-cost tool for designing their own

full-custom integrated circuits. The emphasis lies on user-friendly software, training, and efficient and flexible support from design centers located near the client. At the manufacturing level, the use of direct electron-beam writing on the wafers considerably reduces the cost and manufacturing time for limited series and prototype production. As opposed to conventional foundries organized to produce a maximum of silicon, the ES2 factory is structured to produce the largest number of lots in the smallest amount of time. The objectives to complete a whole manufacturing cycle in 2 weeks. It goes without saying that radical reorganization of the manufacturing process was necessary to reach these goals. The currently available technology is a 2-micron CMOS [Complementary Metal Oxide Semiconductor] with two metallization levels.

In addition to being the ultimate in prototype manufacturing, the process of direct writing on the wafer is also economically advantageous for small production series of 5,000 or 10,000 units per year. For larger quantities, ES2 has second source agreements with manufacturers with compatible CMOS technology.

For design and customer support, ES2 has three centers located in Paris, London, and Munich. Around these three centers is a network of franchised design centers serving all other European countries. For Belgium an exclusive representation agreement was signed with SDM (in Loverval). This agreement has been embodied in a new ASIC design center in Brussels.

Equipped with ES2 workstations, this specialized design center gives Belgian electronics specialists easy access to all the ES2 products ranging from manufacturing to design.

25 006/9599
CSO: 3698/A012

FRG RESEARCHERS DEVELOPING COSY X-RAY LITHOGRAPHY MACHINE

Zellik TECHNIVISIE in Dutch 19 Nov 86 pp 14-15

[Article by A. Calders, engineer: "X-Ray Lithography Also in Europe"; first two paragraphs are TECHNIVISIE introduction]

[Excerpts] In the United States and in Japan there is great interest in X-ray lithography. It is regraded by some as /the/ [emphasized in original] chip production technique of the 1990's. While electron-beam and ion-beam processes are considered to be the technology for relatively quick production of submicron chips in small production runs, X-ray lithography is seen as the method for producing standard chips with submicron-sized structures through parallel processing.

The first industrial initiatives involving this technology in Europe began with the creation of COSY [Compact Storage Ring for Synchrotron Radiation] MicroTec GmbH on 24 September last. Through its shareholders, COST MicroTec has a strong influence on the chip industry. Besides Leybold-Heraeus, the major shareholder, three other chipmakers are taking part: Philips, Siemens, and Telefunken Electronic.

X-Rays for Submicron Chip Production

Six years ago, the Fraunhofer-Institut fuer Mikrostrukturtechnik in cooperation with the German chip industry initiated a project to study X-ray lithography as an alternative to photolithography for the production of chips with smaller line widths.

The main problem with X-ray lithography is finding a good source. There are three possibilities: First comes the conventional X-ray source. Second comes the use of the plasma X-ring. Third comes synchrotron rings (synchrotrons are devices that accelerate subatomic electrically-charged particles). These are powerful directed X-ray sources which are, however, enormously large. An example is the BESSY storage ring in Berlin, which has a 3-kilometer diameter. But in addition to the large size, manufacturing costs are so high that cost-effective production of chips is impossible.

Results

Thus, research continued in the Berlin research center and led to a concept for the COSY compact synchrotron storage ring. This is the first synchrotron

radiation source for X-ray lithography using superconducting magnets (superconducting magnets are electromagnets cooled by liquid helium, which causes metal conductors to lose their resistance, which considerably increases their performance). Thus it became possible to develop a more compact machine (30 square meters of floor space) to which several wafer steppers can be connected simultaneously. The machine has been designed to generate eight beam lines.

The storage ring is a ring-shaped radiation conductor equipped with two superconducting magnets. Beam lines are placed tangentially on the ring's perimeter where the X-rays are emitted. Safety precautions impose a 3-meter minimum length. These beam conductors are connected to the wafer steppers and are designed to maximize X-ray conductivity. The electrons are introduced into the accelerator with a particle energy of 50 MeV using microtrons. The storage ring contains focusing and accelerating elements.

Thus this machine allows exposure of several wafers at a time using the multiple wafer steppers, which permits production of larger quantities of submicron structures.

25017/9835
CSO: 3698/A062

OVERVIEW OF EUROPEAN COMPUTER-INDUSTRY RESEARCH CENTER

Le Chesnay BULLETIN DE LIAISON DE LA RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE in French Oct/Nov 86 pp 18-20

[Article by M. Gallaire of ECRC: "ECRC = A European Research Center"]

[Text] The European Computer-Industry Research Center (ECRC) was created under the initiative of three major European computer manufacturers: Bull, ICL, and Siemens. The goal of this joint effort is to strengthen the competitiveness of European industry in computer technology in general and in artificial intelligence in particular.

ECRC Origin and Structure

The ECRC began operations in Munich on 1 January 1984 with a staff of four, including one researcher. Today, there are 45 full-time researchers and a total of over 60 employees and associates. ECRC is an independent company with West German registration (GmbH), owned in equal shares by its three founders. This company is in keeping with the Europe-oriented mentality that was strengthened in the early 1980's. While the ESPRIT program is certainly the best known manifestation of this movement, it has assumed many forms, including a standardization effort highlighted by an agreement involving 12 European manufacturers (SPAG [Standards Promotion Application Group]) and, more recently, EUREKA. ECRC is another expression of this desire, based on very close cooperation among the shareholders.

The center interacts with two bodies:

--The Shareholders Assembly, which approves programs and budgets and oversees their execution;

--The Scientific Committee, which advises the Shareholders Assembly on program selection and future policy.

ECRC researchers come from a great variety of backgrounds. No fewer than nine different nationalities are represented. Most researchers with ECRC contracts are actually on renewable 3-year assignments from the owner companies. They may already be employees of these companies, or they may be hired for immediate assignment to the ECRC. Other researchers are hired directly

by ECRC. Finally, ECRC accepts various types of interns for variable periods of time, including public research staff on temporary assignment and foreign researchers.

Research

ECRC is a joint research center of three companies having no agreement on development or systematic marketing. Therefore, it develops no actual products, only its own demonstration models. It works on tools, techniques, and methodologies.

Computer-Aided Decisionmaking

This major focus comes primarily from artificial intelligence. A dual approach is suggested for its development:

--Integrating currently available AI techniques, while making allowances for additional requirements at the systems or applications level;

--Seeking solutions to new problems and developing the new functions necessary for these systems or applications.

ECRC thus expects to reach its goals through this dual strategy of fundamental research and of integration of solutions already available in the systems. The topics actually selected for study cover the many varied components of decision support systems. A specific work strategy has been adopted which ties the varying projects together: This is the logical approach to knowledge representation and handling. While obviously not excluding other approaches, this approach ensures a certain coherence throughout the work. In its initial work phase, based primarily on fundamental research and model production, the program includes the following studies:

Logic Programming

The entire program is based on a logical approach to knowledge representation and handling. This necessitates an extension of currently available solutions, particularly of the Prolog language. Three projects are currently under way:

--Development of a Prolog compiler generating C language code to achieve portability. The compiled language is a form of Prolog extended by execution control management primitives, specifically, "wait" primitives which are very important to both program efficiency and program correction.

--Design and development of tools needed to enhance the expressive capacity of logic programming, including extending the programming style by incorporating object programming into logic programming. The goal is not merely to juxtapose the object and logic programming paradigms, but to truly integrate them through a distinctive sort of logic. It also involves defining and developing techniques for constraint programming: The programmer associates certain constraints, such as equations, in the program, which manage program execution, thus eliminating futile search lines.

--Lastly, other projects involving the logic programming environment, particularly development of a sophisticated trace system making it possible to modify the environment during the trace, to "view" various elements of program execution, etc.

Knowledge Bases

This involves defining and producing an intelligent system of databases, capable of:

--Representing complex and structured objects, not just relations (semantic databases enhanced by AI techniques);

--Using knowledge statements to manage deductive information, create dynamic views, enhance query capacity, etc.

--Efficiently managing rules for the integrity and consistency of data.

The database component is relational, but a semantic level has also been developed. The complementary functions mentioned here are provided by a deductive mechanism coupled with the database system. The project is examining several different approaches to the system: A tight coupling, where requests are processed and managed by Prolog under programmer control, and loose coupling, where a database request language is integrated in Prolog, but management and dispatch of requests are still controlled by the programmer. An integrated system is also being studied in which requests and programs are interpreted by a mechanism which handles management problems (recursion halt, completeness of the search,...). Problems of coupling optimization are also being examined. Basic studies focus on automatic verification of integrity constraints while updating data, deductive rules, and constraints. They are also looking at verification of rule coherence (a problem distinct from that of constraint verification), which will be followed by the implementation of other aids for the database designer. Several prototypes are available, each corresponding to one of the above areas.

Man/Machine Interface

Use of complex systems such as knowledge bases is not without its problems. There are two types of projects:

Using a Knowledge Base

The knowledge base user is not by nature an expert in query languages. One alternative to using natural language is the use of techniques based on the bit map graphics and the inference capacities of the knowledge bases: using symbolic representations (icons) of the base design (extended semantic models), visual display and scanning of semantic graphs, locating paths within graphs linking relevant items, visual navigation, etc. Studies are dealing with both user interfaces and the methodology for creating these interfaces. The problem to be solved involves the sharing, copying, and coherence of the necessary and existing data structures in the application

for which the interface is being created and in the interface management program. A model has been produced based on the knowledge base prototype developed by the previous team.

Semantically Aided Decisionmaking

The problem examined here concerns necessary improvements in the relationship between the user and aids to decisionmaking (databases, knowledge bases, special purpose programs such as spreadsheets, etc.). These improvements must target two objectives: helping the user to better understand these aids by actually using them, and offering the user more powerful aids. A number of techniques are being studied, including help generation, the presentation of graphic and textual information, interaction techniques, etc. A model for help generation already exists.

Experiments with users are being undertaken to measure the results of the studies mentioned above.

Systems Architecture

The above-mentioned studies imply the need for certain inference techniques. Development of systems which implement such techniques is beset with performance problems, such as execution speed and memory requirements. Specialized architecture for this type of system is currently being designed: parallel architecture for Prolog, based on functional units executing an extended intermediate language to accommodate OR type parallelism and various types of AND parallelism.

The structural modeling and an extended Prolog programming language (degenerate form) have been defined, an interpreter written, and various simulations are in progress. The goal is an efficiently managed multiprocesssor system (with no activity generated if resources are not available), as opposed to massive parallel systems.

Another study is being done on sequential running of Prolog, analyzing a number of object processors which should be able to function either as back-end or central processors. The study is also looking at software aspects of connecting such processors to host computers.

Cooperation

Cooperation among ECRC shareholders takes various forms, ranging from a simple exchange of information intended to give ECRC an idea of a shareholder's strategic planning or technical findings all the way to formal knowledge transfers. Seminars on specific topics bring together ECRC personnel and the personnel of the R&D services or research centers of the three companies involved. Over the medium term the transfer of personnel is certainly an essential element in this cooperation.

ECRC publishes its research results and is open to cooperation with universities; it welcomes researchers for varying time periods, supporting theses and dissertations.

Conclusion

On the research level alone, ECRC represents an innovative type of collaboration among competing companies in Europe. But ECRC is also an opportunity for its three founding members to promote Europeanism through numerous contacts at all levels.

References

Bocca, J., "On the Evaluation Strategy of EDUCE," Proc. ACM-SIGMOD Conf. 86, Washington, D.C.

Nicolas, J.M., et al., "Some Steps Towards a DBMS-based KBMS," Proc. IFIP Congress 86, Dublin.

Vieille, L., "Recursive Axioms in Deductive Databases the Query/Subquery Approach," Proc. 1st Conf. on Expert Database Systems, Charleston.

Van Hentenryck, P., and Dincbas, M., "Domains in Logic Programming," AAAI 86, Philadelphia.

25054/13046
CSO: 3698/A067

FINLAND-CEMA COLLABORATION AGREEMENT ON R&D UNTIL 1990

Helsinki HELSINGIN SANOMAT in Finnish 22 Nov 1986 p 37

[Article: "Finland and CEMA Sign Collaboration Agreements]

[Text] A total of 20 collaboration agreements were signed in the meeting of the Commission on Collaboration between Finland and CEMA [Council for Mutual Economic Assistance]; the meeting ended in Helsinki on Friday. The recommended projects were in the areas of ship-building research, automation technology, road construction methods, special containers, food processing, energy conservation and supra-management research.

The commission also issued 13 recommendations, based on which companies and institutes in Finland and the CEMA countries will exchange data, experience and samples in the areas of chemical industry, transportation technology and energy economics.

The commission issued two recommendations for the simplification of trade practices and approved six new standards to be applied in trade and other forms of collaboration.

The chairman of the meeting was Jermu Laine, foreign trade minister. Laine reports that a new feature in the collaboration between Finland and the CEMA is that the guidelines will extend till the year 1990. They take into account the principles of the technology program of the CEMA countries extending until the year 2000.

As examples of future areas of collaboration, Laine mentioned automated process control systems.

In the area of statistics, a long-term project on mutual correlation of national economic accounting systems has been completed; it was made, with the help of CEMA secretariat, on the basis of real data from Finland and Bulgaria. The results of the comparison will be studied in the UN European Statistics Conference and the material of the joint project will be published.

12956
CSO: 3698/131

SPANISH PARTICIPATION IN EUREKA

Madrid EL PAIS in Spanish 9 Oct 86 p 16

[Text] There are few countries in which the Eureka technological program has aroused so much enthusiasm as in Spain. Our country is participating in 14 projects, and in seven of them the leaders are national companies. Spanish investment has reached 21 billion pesetas, which represents 21 percent of the total. In addition, Spain heads 10 percent of the Eureka projects and can consider itself the fourth ranking country in the program, surpassed only by France, Great Britain and Germany. But despite the fact that the leadership has been reserved to the companies, state help has been substantial because 50 percent of the investment represents money contributed by the state on the basis of a contingency fund or "soft" credits.

Medical Informatics

The Galeno 2000 project seeks to resolve a number of problems encountered by medicine. The system will offer a simple and cheap method of diagnosis with sensors that--as the name indicates--will operate without invading the patient. Also envisioned is the creation of a health card that will include a powerful chip containing the clinical history of the patient. Thus, each citizen could carry his clinical history on a small card and the doctors could use it in any emergency.

Aerospatiale, which is participating with 27 percent, will develop the card and its interface with the data systems. Spain will be responsible for one of the sensors through the Madrid Sensor Technology Company.

Project: Galeno 2000; company: IDS; Spanish percentage: 40 percent; total budget: 7.365 billion pesetas; duration: 3 years.

Future Traffic

The Europolis project seeks to resolve the problems of management and control of urban traffic through the creation of an intelligent system of processing and control of information. The initiative will involve many technological advances in the area of sensors, telecommunications, microelectronics, and artificial intelligence in terms of its application to the process of urban information.

Among other specific aspects, work will be conducted on sensors and detectors that will make it possible to implement a system of automatic analysis of urban traffic flow. Also, in the development of means of controlling traffic signals, expert and intelligent control systems, and telecommunications means that will make it possible to notify the vehicles and companies of the most appropriate routes and roads.

Project: Europolis; company: IDS; Spanish percentage; 40 percent; total budget: 14.996 billion pesetas; duration: 7 years.

8711/9190
CSO: 3698/123

DUTCH PROJECTS IN ESPRIT II, 1987-91

Rijswijk PT/AKTUEEL in Dutch 8 Oct 86 p 9

[Article by Richard Hovers: "Second Phase of European ESPRIT Project Starts in 1987 with Increased Budget"]

[Text] On 28 February 1984 the EEC Council of Ministers approved the main ESPRIT program for European research in the field of information technology. It was planned to run 10 years (1984-1993). By December of the same year, EEC companies and scientific institutions working in successful cooperation had already snapped up the nearly 2 billion guilders budgeted for the first 5 years. The European Commission is particularly pleased by all this European solidarity and has now proposed to the Council to bring forward the spending for the second 5-year period. It is hoped that increased subsidies of 5.6 billion guilders will enable the European computing industry to reach world standards.

There is a glaring contrast between the glacial decisionmaking process as regards the perfection of the internal EEC market, which is essential if Europe is to be effective and competitive in the world of tomorrow, and the rapid progress in the European research program in information technology. ESPRIT (European Strategic Program for Research and Development in Information Technology) has been a source of amazement for European policymakers, because the market sector has been tremendously active and inventive in its efforts to keep up in developing and applying modern microelectronics.

In its first 3 years, ESPRIT can boast that a total of 219 projects have been initiated, out of 1,100 applications (through 1986). These involve more than 450 firms, universities, and research institutions. Almost all the projects run for a period of 5 years. Of the nearly 2 billion guilders allocated to these projects, roughly 80 percent is going to develop microelectronics, software, and information processing in office systems. Only 13 percent goes for computer-integrated manufacturing (CIM). The Directorate General for Telecommunications and Data Processing in Brussels, which coordinates ESPRIT, notes that of the 450 participating organizations, 280 are businesses. Of these, 170 are small and medium-sized firms with fewer than 500 employees. Smaller firms are participating in over half the projects, and universities are actually involved in 80 percent of them. The number of people currently working in Europe on ESPRIT projects is right around 3,000.

Billions

It is understandable that businesses and scientific institutions are most eager to receive the subsidies, which cover about half of a research project's total costs, because prospects for the future are not very bright. It is estimated that in 1990 Europe will be the largest market for IT [information technology] products and services, accounting for about 30 percent of the world market. If current trends continue, European manufacturers' share of their home market will sink to 21 percent. And it is best not even to think about their share of the non-European market. At the same time, world spending on IT research and development will rise from 87.5 billion guilders in 1985 to an estimated 225 billion guilders in 1990.

To get a better feel for these figures, we might, for instance, look at what the U.S. government will spend this fiscal year on high-tech research and development. This year, that sum, a large portion of which goes for IT research, will exceed 108 billion guilders, almost 300 million guilders a day!

When the current 219 ESPRIT I projects are completed, they will have cost a total of about 4 billion guilders (split 50-50 between EEC and industry). The Community's present contribution to ESPRIT is less than 0.5 percent of the EEC budget. But even this level of financing is important, given the fact that ESPRIT covers 15-20 percent of total European expenditure on basic precommercial IT research.

ESPRIT II

With the Uniform Act of Luxembourg, the European Council resolved to set up a solid technology support program to improve EEC competitiveness and bring about extensive integration. The European Commission has now produced a proposal for an overall technology program. This "framework-programme" is to run 5 years, 1987-1991. The proposal provides for a budget of almost 20 billion guilders, of which 8.5 billion guilders is to develop data processing technology and telecommunications. This includes the 5.6 billion guilder budget for the second phase of ESPRIT. It would bring forward the second 5-year plan for ESPRIT--which was actually supposed to run from 1989 through 1993--and incorporate it into the 1987-91 framework-programme. The ESPRIT II budget would almost triple, compared to ESPRIT I. That seems reasonable, given the tripling in planned man-years required for the second phase (from 10,000 for ESPRIT I to 30,000 for ESPRIT II).

This would mean that by 1991 European high-tech industry will have benefited from total ESPRIT subsidies of 7.5 billion guilders. Since business has to contribute 50 percent of research costs itself, total IT research expenditures would amount to 15 billion guilders over an 8-year period. That does not seem like much in comparison with the enormous sums being spent by the United States, but of course the national governments of the EEC member states also provide no small sum to subsidize and stimulate modern technology. The Netherlands' Data Processing Stimulation Project (INSP), for instance, provides 245 million guilders in subsidies, while the sum of 230 million

guilders has been allocated to encourage the use of data processing in agriculture in this country.

Goal

The continuation of the ESPRIT program is set up in accordance with the Council of Ministers' recommendations. Industry, universities, users, and national governments were closely involved in the decisionmaking process. The most important recommendation is to continue precommercial research and development, building on the cooperation that has already taken shape. This cooperation is to be consolidated, both among the various IT sectors and between manufacturers and users, so that each ESPRIT project is oriented toward industrial demand at a later stage in this European initiative. The final goal is to integrate IT's into application systems.

The emphasis on integrating technology is supposed to lead in ESPRIT II to intersector projects ("Technology Integration Projects") combining research results. This raises the insuperable difficulty that European precommercial research is more and more oriented toward applications, and this raises the sensitive issue of competition among companies. How this will be handled is still unclear, but it is certain that Western industry will drop out if the European Commission and Council make the receipt of subsidies subject to conditions in this area. Political influence on the market mechanism and industry is certainly unacceptable at the European level to most companies.

The goal of ESPRIT II is to focus and coordinate technology sectors in order to achieve an ongoing competitive position in key areas of advanced components such as microelectronics. This is to lead to the construction of new, competitive European computer systems and extensive factory automation.

At the same time, ESPRIT II broadens the European dimension of the program, since it makes it possible to include participants from the EFTA countries. This means that after 1986 Denmark, Sweden, and Norway will be able to participate in ESPRIT projects.

The Netherlands

Philips, the Netherlands multinational, is the largest European participant in ESPRIT. In the past 3 years (1984-86), the firm has participated in 32 projects, most of which run 5 years. Altogether, these projects have received a subsidy of 115 million guilders, some 6 percent of the 2 billion guilders the EEC has made available.

Total research expenditure is twice that. This works out to an average cost per project per year of over 1.4 million guilders. By the end of 1986, Philips may be involved in some 40 projects, according to Philips spokesman Niels Wiedenhof.

Philips accounts for a good half of total Netherlands participation in ESPRIT projects. Apart from the multinational, some 20 Netherlands companies and universities are participating in about 30 projects. Thus, Netherlands firms and universities represent about 4.5 percent of all those participating.

However, this apparently low percentage of companies and universities is participating in one third of all ESPRIT projects now underway. For the Netherlands, that is a very respectable figure.

Netherlands companies participating in ESPRIT include BSO/AT, Oce van der Grinten, the software house Interprogram and Raet and the branches of Foxborough and James Martin Associates. Among the participating universities are Twente Technical University, Nijmegen Catholic University (each with five projects), the University of Amsterdam, the Erasmus University, the University of Utrecht, and Delft Technical University.

Projects

The BSO Automation Technology systems house is participating in two ESPRIT projects. The "Generation Interactive Programming Environment" (GIPE) project is developing a system to generate a programming environment. The goal is to make it possible simply to load a desired computer language into a computer and then have the computer understand and process programs in that language. The second project involves the development of a management support project named PIMS.

Nijmegen Catholic University is participating in five projects. Members of the Psychological Function Studies Section are working on the development of intelligent work stations (language recognition, together with Oce van der Grinten) and on pattern recognition of handwritten texts. A third project involves the development of speech recognition systems. There are also projects involving the development of functional programming languages and research into analytical chemistry using expert systems.

The recently announced list of ESPRIT projects approved in 1986 includes only two Netherlands contributions. One is the last-named research project at Nijmegen Catholic University, and the other is a chemistry project involving Duphar Nederland. Belgium is mentioned 6 times on the list, West Germany 9 times, Britain 23 times, and France no less than 24 times, but we're all good Europeans and so who's counting?

12593
CSO: 3698/254

SPANISH PARTICIPATION IN ESPRIT

Madrid EL PAIS in Spanish 20 Oct 86 p 57

[Text] Brussels--It was announced yesterday at a conference attended by about 1,000 businessmen, high-level officials, and scientists, that seven Spanish companies have been selected by the European Commission to participate in four of the last five projects of the Esprit community program of research on information technologies, which is budgeted at 8.905 billion pesetas.

The director general of electronics and informatics of the Ministry of Industry, Julio Gonzalez Sabat, observed, however, that Spanish participation in the overall Esprit program was "still low" because it only represents 5 percent of the total and no Spanish company heads a program. "Between now and 1988, we expect to reach 10 percent," he added.

Since joining the Esprit program, which went into effect in February 1984, 2 years before the entry of Spain into the European Community (EC), Spanish researchers have distinguished themselves by their work in the area of management and signal processing systems and in software.

The Spanish companies selected are: O Dati Espanola SL, Sofesama, CCS-SCYT, DITSA, MAPS Informatica Industrial, and the Universities of Santiago de Compostela and the Catalonia Polytechnic. The projects are related to the models for evaluation of software productivity, architectural techniques, oncological therapies, and integrated knowledge with decision control for multi-sensoring systems.

The announcement made public yesterday marked the conclusion ahead of schedule of the first phase of Esprit, during which the EC has spent 103 billion pesetas financing 50 percent of about 200 basic research projects. The second 5-year stage, which will begin in early 1987, 2 years ahead of schedule, originally should have had the same budget but the success of the previous stage has led the commission to ask the states for funds in the amount of 342 billion pesetas, which it appears it will be able to obtain. Ten Spanish companies prepared to collaborate in seven projects have presented themselves for the first assignment of this second stage, which will be made public early next year, and it is hoped that they may obtain 2 billion pesetas.

8711/9190
CSO: 3698/123

HIGH-LEVEL S&T GROUP IN FRANCE ANALYZES 1987 R&D BUDGET

PARIS AFP SCIENCES in French 16 Oct 1986 pp 17-21

[Text] After the publication of the research budget proposal figures by the minister for research and higher education, the High Council for Research and Technology (CSRT) maintains a reserved opinion on the general French research outlay planned for 1987.

Although he noted that from now on "the projected increase of 5 billion [trillion] francs in military R&D credits" is now included in the figures quoted by the government, "their allocation, most of which is earmarked for the industrial sector, will compensate for the fall in credits shown in the civilian R&D budget (BCRD), CSRT noted "without precise information on new proposals which will be supported by the defense Ministry" it "is not able to go any further in the analysis of the consequences, from the viewpoint of industrial research and the increase in these credits."

Considering that it has been relieved of the emergency duty it was requested to perform several months ago, CSRT has now officially published the opinion it formulated 3 July on the budget and will complete it after having considered the latest information provided durings its plenary session on 25 September. Here are the two passages:

CSRT's opinion on the BCRD Proposal for 1987

During its plenary session of 3 July 1986, CSRT examined the civilian research and development budget (BCRD) proposal for 1987, using information provided by the Ministry of Research and Higher Education.

CSRT noted that the years 1986 and 1987 mark a distinct change in the research and technological development policy as compared to previous years, and as compared to outlooks planned for the end of the 9th plan and shown in the law of December 1985 concerning the Three-Year Plan.

This change appears in the total volume of the BCRD and in the large internal balances which are manifested by policies for the development of research and technology in France.

A. The volume of the BCRD: risk in a decline of total outlay of French R&D.

The cuts of 1986 (previously analyzed by CSRT on 24 April 1986) have reversed the increase in the BCRD by 4 percent in volume compared to 1985, and selectively affect the EPST and tax breaks intended for industrial research.

The BCRD proposal for 1987, according to information supplied to the Council, demonstrates the desire of the Ministry of Research and Higher Education to compensate for some effects of these cuts.

In fact, although the increase in the 1987 BCRD was only 0.6 percent in value as compared to the revised 1986 BCRD, within the 1987 BCRD, the MRES budget should increase by 5.6 percent, which should allow the April 1986 cuts to be partially offset.

Nevertheless, in volume, the 1987 BCRD proposal shows a marked decrease as compared to the 1985 BCRD. To return to the 1985 level in real terms, it would be necessary for the 1987 BCRD to undergo an increase of more than 6 percent in value.

According to CSRT estimates, the decline in the total French Research and Development outlay (DNRD/PIB) [National R&D Expenditure/Gross Domestic Product], the recovery of which began in 1979, will become difficult to avoid in 1986 and 1987.

Indeed, taking into account the outlook for growth of the PIB [GDP] for 1986 and 1987, and assuming that public credits excluding BCRD (Defense, P&T [Posts and Telecommunications]) will not decrease, the diminution in public expenditures can only be compensated for by a rapid and insignificant increase in corporate financing of research. This increase, which did not appear to have been begun in 1984 and 1985, justified measures for the stimulation of industrial research undertaken in the Three-Year Plan (tax credits and incentive credits). The trends in this area have always undergone slow fluctuations, and a rapid takeover of public financing by industrial financing appears unlikely.

B. BCRD policies: current priorities challenged and uncertainties concerning new strategic choices.

The strategic policies and large balances of the development of research outlay for the end of the 9th Plan have been essentially disrupted through the review of this budget proposal for 1987.

In their analysis, the Research Commission and CSRT proposed some policies and desirable balances in the development of research outlay, taking into account opinions expressed on French research by French and foreign experts, particularly OECD. Some of these analyses and proposals were incorporated into the Three-Year Plan (1986-1988) which, in particular, prescribes:

Respecting certain large balances among large programs (space, nuclear power, civil aeronautics, etc.) general industrial research and basic research

(operation of laboratories, medium-heavy equipment and computer facilities); the stimulation of industrial research, particularly in the traditional areas playing an important role in the economy and employment; the continuation of outlay favoring basic research, particularly that intended to support applied research, technology research and training; and a long-term scientific employment policy designed to compensate for the effects of recruitment observed in the past.

In 1985, CSRT determined that the implementation of these priorities was undertaken in the 1986 budget, but emphasized the dangers that inadequate management of PDT (Programs for Technological Development) could cause in 1987 and 1988 with regard to these priorities.

In April 1986, CSRT emphasized the extent to which cuts in credits have upset these balances and priorities. It requested an urgent adjustment in the 1987 budget.

Examining the 1987 budget proposal on the basis of information provided, CSRT reported the following:

1) In terms of scientific employment, the elimination in 1987 of 900 jobs is not compensated for by the creation of 527 jobs for the training of young researchers, and yields a deficit caused by the elimination of jobs in public research (373) instead of the 1400 new jobs planned for 1987 in the Three-Year Plan. The undertakings of the Three-Year Plan are based on an analysis in the year 2000 of scientific employment policy. This is the first time in the history of post-World War II French research that we have seen the elimination of jobs. In addition, uncertainties now weigh heavily concerning the creation of jobs for the year 1986 after cuts in credits in April 1986, the freeze on vacated jobs, and the decree by the Council of State concerning the CNRS.

Considering the information supplied to the Council on the distribution among ITA [Engineers, Technicians, Administrators], the researchers in the newly-created jobs (527), and the elimination of jobs (900), CSRT has noted that a modest increase in the pool of researchers and executives (+1 percent) may be obtained at the price of a decrease of approximately 1.5 percent of the pool of engineers, technicians and administrators. This distribution is capable of offsetting a catastrophic drying up recruitment of researchers in 1987.

The elimination of a large number of ITA jobs (which is superimposed on the elimination of ATOS jobs by Education Nationale risks having extremely deleterious consequences on the operation of laboratories. Scientific and operational criteria must be rigorously applied instead of and in place of administrative criteria which haphazardly eliminate jobs of engineers and researchers in laboratories as the jobs become vacant.

2) Basic research remains underfunded. The modification of support for EPST laboratories is far from over when they have selectively undergone cuts of 10 percent of their AP [Program Authorization] in April 1986. The deficit in medium-heavy equipment and computer facilities may be partially rectified. However, considering the fact that the 1986 cuts in credits primarily affected the EPST and their volume was significant, it is clear that the level of adaptation planned for in the first years of the Three-Year Plan will not be achieved and the operation of laboratories will be at a level lower than or equal to that in the 1985 budget.

3) With regard to industrial research:
CSRT reconfirms that the stimulation of industrial research in France is a top priority for the development of competitiveness of French industry, in the face of technological changes and international competition. The Three-Year Plan provided for both indirect and in the form of incentive credits specifically designed to stimulate research in traditional sectors, important for the economy and for jobs (including PME [Small to Medium Businesses] and PMI [Small to Medium Industries] and in broad-based technology (usable in different branches of industry).

For example, it is quite obvious that in the agri-foodstuffs sector, these credits are irreplaceable. Similarly, they have a significant leverage effect on regional financing, particularly in the implementation of technology transfer activities.

CSRT has determined that the volume of these incentive credits, already severely affected by the April 1986 cuts with the elimination of 40 percent of the FRT [Research and Technology Funds] and ANVAR [National Agency for the implementation of Research], in 1987 will not achieve the initial goal set in 1986, a level already considered to be insufficient.

In addition, although it is unlikely to occur, assuming corporations would be capable of compensating for this decrease, the Council is trying to emphasize the inevitable delay between the diminution of public incentive credits and the effects on business.

In the absence of information on the intentions of the government, CSRT thus expresses its apprehension about the future of the policy for stimulating industrial research in France.

4) As far as the large PDT's (Technology Development Programs) and their relative proportion on the overall BCRD, unknowns persist. With the prospect of an increase of 0.6 percent in the value of the 1987 BCRD, only the space program continues to grow, whereas, the nuclear power and especially the ocean and aeronautics PDT's are decreasing. The Council can only firmly repeat its previous recommendations: the timetable and rate of growth of each of the large technology development programs in France must be carefully examined to avoid unbalancing, as was the case, in the past, French national research outlay which, to be coherent, must also involve the development of industrial research (outside large traditional programs), basic research, and cooperation between industrial research and public research.

C. Conclusion.

CSRT determined that, with the current state of available information, that the civil research and technology development budget proposal for 1987 rectifies certain isolated effects of the cuts made in April in the 1985 budget. Nevertheless, CSRT, while recognizing the efforts of the Ministry of Research and Higher Education, can only take note of the disquieting change in French research and technology development policy since the cuts of 1986.

This change effects not only the total R&D outlay in France, but also the choice of development priorities:

The 1987 BCRD proposal will not allow the fall in total R&D outlay in France caused by the April 1986 cuts to be rectified, and the gap between our country and foreign competitors risks becoming larger, whereas in 1982, France succeeded in maintaining fourth place.

The priorities defined in the Three-Year Plan following recommendations of the CSRT Plan commission were drastically changed: the elimination of jobs (researchers and ITA) shown in the 1987 BCRD proposal reverse a necessary long-term scientific jobs policy; the continuation of basic research, challenged by the April 1986 cuts will not be re-established at a sufficient level in 1987; the stimulation of industrial research is seriously threatened: the incentive credits intended for it were considerably reduced and other compensatory measures have not yet been defined.

Faced with this situation, which has resulted exclusively from the analysis of 1986 budget and 1987 budget proposal cuts, CSRT requests that the major policies for development of research and technology for the end of the Plan and the means for achieving it in France be redefined and publicized.

Addition to the CSRT Opinion on the 1987 BCRD Proposal.

During the 25 September plenary session, CSRT examined the final research budget proposal for 1987. The presentation of this budget proposal made to the Council by the Ministry concerned the BCRD for which the Council rendered an opinion during its 3 July 1986 session, as well as the outlook for increases in 1987 of military R&D credits. Thus, it was indicated to the Council that the R&D budgetary outlay (EBRD) combining civilian and military credits will increase by 8.1 percent as compared to 1986 (after the deficiency bill).

The Council determined that the analysis it carried out on the BCRD proposal as a whole remains relevant. It also determined that, in concentrating its analysis on the BCRD, it was possible to make significant comparisons with previous years. However, CSRT wanted to make two additions to its 3 July opinion.

1. With regard to prospects for growth in the total R&D outlay of the country, the risks of a decline examined for 1987 by CSRT now appear to have been lessened because of the planned increase by 5 billion [trillion] francs of military R&D credits in 1987. Their allocation, for the most part earmarked for the industrial sector, will allow the fall in credits (incentive credits) shown in the BCRD in 1987 to be compensated for, unless a large delay occurs.

By contrast, for 1986, the Council estimates that the decrease in credits following the deficiency will have negative effects on the continuation of the recovery of the country's total outlay (DNRD/PIB [Domestic Research and Development Expenditures/GDP] ratio) begun in 1979. CSRT also noted that through these growth outlooks which are extremely unbalanced, to the detriment of civilian credits in favor of military credits, the portion of the BCRD is decreasing in the country's outlay.

2. With regard to domestic policy approaches, the Council wants to add some supplementary discussions concerning industrial research to its 3 July 1986 opinion. The significant increase announced for 1987 in military R&D credits is, in quantitative terms, a new element from the viewpoint of support for industrial research, although these credits essentially concern development projects.

In addition, their allocation has traditionally been concentrated on a limited number of sectors (aeronautics, electronics, nuclear power, etc.), which leaves the problem raised by CSRT concerning the other sectors and broad-based industrial research, excluding large programs, in that the overall decrease in BCRD incentive credits for industrial objectives (ANVAR, AFME [French Energy Management Agency], ADI [Computer Technology Agency], FRT, etc.) will weaken it even more.

Without precise information on new proposals that will be supported by the Defense Ministry, CSRT cannot go much further in the analysis of the consequences, from the viewpoint of industrial research, of the increase in these credits.

13146/12624
CSO: 3698/114

EUROPEAN COST PROGRAM FOR S&T RESEARCH OUTLINED

Amsterdam COMPUTERWORLD in Dutch 11 Nov 86 p 19

[Article by Jan Schils: "Results of 15-Year European COST Activities Involving 19 Countries: Data Processing and Telecommunications Stand Out"]

[Text] Brussels--Nineteen European countries are currently celebrating the fact that they have been conducting transnational research for 15 years. The research in question involves the so-called COST programs, several of which were of such scientific and technological interest that they gave rise to national or EEC research programs. This could be explained by their ever-increasing impact on the technological changes in our world.

COST stands for European Cooperation in Scientific and Technological Research. From the beginning (now more than 15 years ago) 19 countries have participated in coordinated COST programs.

In addition to the 12 EEC members, Norway, Sweden, Finland, Switzerland, Austria, Turkey, and Yugoslavia are also involved. Thus far, about 55 COST programs have been completed or are still in progress. Over more than 15 years, the participating countries have invested well over 370 million guilders in these programs.

Avoid Friction

To prevent cooperation from being hampered by unnecessary friction, the European Commission assumed coordination of the COST programs through a secretariat staffed by European civil servants. Every COST program is coordinated by a committee in which all partners are equally represented.

Each country is completely free and can join in and participate in a program at any time. After the exploratory phase in the early 1970's, three major themes have emerged:

--Mutual adjustment of differing standards and regulations in European countries in order to maximize crossborder harmonization, e.g., in the fields of telecommunications and transportation.

--R&D activities which to some extent or other are of interest to all European countries--either on an individual or collective basis--such as

data processing, telecommunications, agriculture, and food technology.

--Worldwide, international research activities on subjects such as oceanography, meteorology, environmental protection, and the development of advanced materials.

Ten Major Themes

Each COST program must fit into one of these major areas. Thus far, 10 major themes have been defined in the following areas: data processing, telecommunications, transportation, oceanography, metallurgy and materials science, environmental protection, meteorology, agriculture, industrial safety, food and social technology.

The bodies which coordinate the COST programs are currently discussing the improvements to be made and how this cooperative program relates to existing EEC research programs and other European initiatives such as EUREKA.

In particular, attention is being paid to the possibility of linking COST with research activities such as ESPRIT [European Strategic Program for R&D in Information Technology], RACE [Research in Advanced Communication Technologies for Europe], BRITE [Basic Research in Industrial Technologies for Europe], and EURAM [European Research on Advanced Materials]. Discussions held thus far suggest that this is not the case for the EUREKA project.

25023/9835
CSO: 3698/A061

NEW S & T CENTER IN VALENCIA, SPAIN

Madrid EL PAIS in Spanish 9 Sep 86 p 43

[Text] Valencia--According to the project revealed yesterday by the councilor of Industry, Commerce and Tourism of the Valencia Generalitat, construction of the first technological park in Spain will begin next year. It will occupy an area of 1 million square meters and will be located in the municipal district of Paterna, some 8 kms from Valencia.

The councilor of Industry revealed that final private investment will exceed 8 billion pesetas. The construction of the Valencia technological park will be carried out in two phases. About 600,000 square meters of land have already been acquired for 300 million pesetas.

It is an initiative of the Institute of Medium and Small Industry of the Valencia Generalitat (IMPIVA) aimed at giving a modernizing impetus to the economic and industrial structures of the Valencian Country. The overall investment envisioned is some 3.5 billion pesetas, including the purchase of land and city planning and infrastructure work. This budget includes the costs of installing research centers.

Various official and private research and development centers or institutes will be installed in the technological park along with private companies to encourage the communication and dissemination of results among the institutions involved--which the technicians call "cross-fertilization"--so that work links can be established that will permit the development of new technologies.

The research centers that will be installed will be the food industry institute, machine-building institute, ceramics institute, and bio-mechanics institute. With regard to technological companies, admission standards will be very selective so that only those that use or produce new technologies will be able to come into the park, provided that they devote at least 3 percent of their gross sales to research and development (R & D);

8711/9190
CSO: 3698/123

SPAIN TO STEP UP S & T EFFORTS

Madrid YA in Spanish 11 Sep 86 p 26

[Text] Madrid--Speaking yesterday at the opening ceremony of the "Eurotelecom 86" conference, on the subject of "The Future of Telecommunications in Europe," the vice-president of the government, Alfonso Guerra, said that Spain aspires to be one of the main pieces in the creation of the Europe of technology. The conference has been organized by the Ministry of Transport, the Telephone Company, and the European Community (EC).

About 500 representatives of what is today one of the most advanced sectors of the European Community are attentind this conference, which will continue until tomorrow, Friday. Fifty officials from the telecommunications sector of the 12-nation European Community have begun to present reports on the advances in this area and to reveal their plans for its future development.

The vice-president announced that Spain will increase its participation in the different technological development programs that currently exist in Europe "until it becomes a leading country in European technology."

Guerra declared that technological development, which has reached unprecendented levels, gives rise to a number of social consequences from which we cannot restrain ourselves or ignore. Finally, the vice-president advocated social control of scientific and technological progress and pointed out that "telecommunications occupies an important place because it is the nerve system that directs all economic activity."

The director general of the telecommunications section of the Economic Community, Michel Carpentier, who also participated in the same ceremony, spoke about the advantages of Europe creating a niche of its own in the field of telecommunications.

8711/9190
CSO: 3698/123

FRG RESEARCH MINISTER ANNOUNCES INFORMATION TECHNOLOGY MEASURES

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 28 Aug No 438, 86 pp 6-7

[Text] Federal Research Minister Riesenhuber has announced measures to reinforce basic research in information technology. German industry has caught up in this field in a remarkably short time. The minister pointed out that it is now important to reinforce the long-term perspectives. Not only business--that is, large firms as well as small ones--should take advantage of this situation, but also scientific institutions.

A team of five scientists set up by Federal Minister Riesenhuber under the chairmanship of Professor Queisser has recommended that the number of scientists working in the field of information technology be more than doubled through support for institutional research and development in the next few years. The Queisser report indicates that, in comparison with the industrial nations competing with us, we can reach parity in research expenditures--per capita of the population--only by such intensive reinforcement of the scientific potential. The team believes that the support of research also constitutes a way to train highly specialized experts which our industry needs.

For the Federal Government, the report also was an important basis for the newly announced basic plan for expansion of basic research in information technology. The crux of the plan is the concentration of research subsidy on the expansion of the research infrastructure for information technology and the reduction of direct subsidy to industry in the next few years.

Four basic points will be pursued in this respect:

--Expansion of the research activity of the large research institutions in this field within the present and future thematic reorientation of research at some of these institutions.

--Considerable reorientation of the support of projects deriving from BMFT technical definitions of "leading-edge fields" of industrial R&D aiming at a considerable--yet limited in time--expansion of capabilities at existing institutions through projects.

--In addition, it will be tested to what extent industry is ready to participate in the support and financing of special research institutions (temporary institutions).

--Together with the federal states, a reinforcement of the capabilities of universities is pursued; this will be supported with appropriate project funds from the federal government.

By exploiting all possibilities and receiving appropriate commitments from science, from industry, and from the federal states, according to the federal minister of research, it would be possible to double research capabilities in information technology by the beginning of the 1990's compared to current levels.

The research minister said that the federal government will contribute to this. The federal government estimates that the plan will last until the mid-nineties. A consequence of the long-term schedule is that the full content of the basic program cannot be established once and for all, but that it needs constant monitoring and further development.

The transformation of the basic program implies that national measures be coordinated with the support measures of the EC Commission and with EUREKA projects which have been started or are planned in the area of information technology.

8629/9738
CSO: 3698/M027

FRENCH S&T WATCHDOG GROUP CRITICIZES 1986 RESEARCH POLICY

PARIS AFP SCIENCES in French 6 Nov 86 p 3

[Text] In its annual report, CSRT (High Council for Research and Technology) criticized the 1986 research policy, particularly some decisions made by Mr Jacques Chirac's government, and described the downward revision last spring of the research budget as a "break" in the growth of French research activity.

In the research policy evaluation document, completed in July and circulated 4 November by the socialist group in the halls of the National Assembly (while the debate on the 1987 research budget was in progress), CSRT especially condemned the cuts in credits concerning research (almost 3 billion [trillion] francs NDLR) decided upon in April.

"These cuts have suddenly reversed the growth of French public activity in research and technological development," explained Mr Francois Kourilsky, vice-president of CSRT, in his report.

Throughout the document, the reporters of this research panel of "wise men" (close to 40 scientific, industrial, and socio-professional representatives) gave their recommendations, in accordance with their consultative functions.

Thus, CSRT recommended that the imbalances related to cuts in credits "must be corrected in the 1987 budget to avoid long-term consequences." On this point, socialist deputies, especially Mr Jean-Pierre Chevenement, noted that the advice of CSRT was not followed by any action.

CSRT also recommended the continuation of government activity with regard to encouraging corporate research, since France lags behind in this area, as well as strengthening the cooperation between institutions of higher education and corporations.

CSRT, created in 1985 by Jean-Pierre Chevenement, then minister for research, also believes it should strengthen regional centers of research and technology and concern itself with scientific employment.

Finally, in an overall evaluation of research policy since 1982, CSRT believes that "significant outlay" has commenced the research portion went from 2.01 percent of the gross domestic product in 1981 to 2.25 percent in 1985).

"The goal has not been achieved," continued the CSRT reporter, who "strongly recommends the continuation of the outlay" in research, this outlay, affecting the "maintenance and increase in French technological competency":
despite the outlay which occurred between 1981 and 1985, France is in last place with regard to research expenditures, in percentage of GDP (2.25 percent in France in 1985, 2.5 percent in Great Britain, 2.6 percent in West Germany, 2.8 percent in the United States, and 2.7 percent in Japan).

13146/12624
CSO: 3698/114

AID TO SPANISH ELECTRONICS INDUSTRY DOUBTFUL

Madrid YA in Spanish 29 Aug 86 p 2

[Text] Madrid--According to sector sources, "It appears very unlikely that the Second National Electronics and Informatics Plan (PEIN II) will be approved, owing to the departure of Joan Majo from the Ministry of Industry, and of the present director general of electronics, Jaime Clavell. As a matter of fact, its presentation was suspended and there was talk about the confrontation between the Ministries of Industry and of Finance because of the refusal of the latter to support the investment of the 30 billion pesetas that implementation of this plan would entail.

According to the president of Toshiba, Juan Vidal, "the PEIN II was still-born budgetarily because there are people who do not believe that it is possible to provide technology in exchange for money and that that is beneficial to the country." PEIN I, the immediate predecessor of this plan was beneficial because it achieved objectives such as the installation in our country of foreign companies that have brought high technology, although that has had a very high economic cost."

The cancellation of PEIN II has been denied by the current minister of Industry, Luis Carlos Croissier, because "we still do not have a predetermined position, since we are studying the budgetary items and the general policy of the Ministry."

8711/9190
CSO: 3698/123

ADVANCED CHIP MANUFACTURING PLANT IN SPAIN

Madrid YA in Spanish 18 Sep 86 p 15

[Text] Madrid--The Industrial Technology Development Center (CDTI) of the Ministry of Industry has assumed responsibility for granting a credit of 729 million pesetas for the installation of the Eurotechnology chip capsule factory. The credit will have an interest of 9 percent per annum and will be granted when the juridically constituted company expands its capital. In exchange, this company, which is an affiliate of the American multinational, Dyne-Sem, will install a center for research and development of encapsulation in ceramic material.

The installation of the factory had been halted since March because the CDTI was looking for an outside agent that would finance the credit promised to Eurotechnology. Finally, the CDTI itself assumed this grant. The chip capsules help to close the cycle of the industrial process begun in Spain by ATT, which designs and manufactures chips.

With this center, our country will begin to develop a technology with a great future, with applications in ballistics, military materiel, and missiles. Along with that is the training of Spanish engineers in this type of technology, which Eurotechnology has committed itself to conduct, and the installation in our country of very sophisticated machinery, such as the artificial vision machines for the processing and selection of chips.

Eurotechnology already has the 1.044 billion pesetas it needed to install the factory, representing half of the total investment of the project. On 28 May, ZUR of Madrid granted a subsidy of 315 million pesetas, which it will be disbursing against the work certifications of the installation of the factory in the Cointra grounds in Alcala de Henares.

8711/9190
CSO: 3698/123

FRENCH SUPPORT TO DATA PROCESSING INDUSTRY EXPLAINED

Paris L'USINE NOUVELLE in French 25 Sep 86 p 47

[Article by Jean-Pierre Jolivet: "Computer Industry: Less State Involvement, More Efficiency"]

[Text] Indirect aid to business, trying small- and medium-sized companies to large state-awarded contracts, giving government offices autonomy in computer related purchases: Without completely abandoning its role (ANVAR [National Agency for the Implementation of Research] will extend its activities to computers and software, while a task force of manufacturers and experts will be responsible for establishing the priority of programs), the Ministry of Industry is changing the rules of its support policy regarding the French computer industry.

The Data Processing Agency [ADI], the Commission for Data Processing (responsible for government offices' purchasing policy), and the World Center for Data Processing will be dissolved due to high costs (ADI has reallocated Fr 268 million to industry out of its budget of Fr 400 million); this move is aimed at greater efficiency.

To strengthen the sector's industrial fabric, Alain Madelin will give priority to programs in which several companies cooperate: There is no longer any possibility of "financing structures."

Similarly, some government contracts with the major manufacturers are to be subcontracted to small- and medium-sized companies. Finally, in order to encourage the commercial aggressiveness of French manufacturers, public contracts awarded by government offices (30 percent of the French market) will be opened to competition. This decision is not without risk to the trade balance of the computer industry, which already registered a Fr 10 billion deficit last year.

The Ministry of Industry is prepared to take the chance, considering the risks of this new course less dangerous than the guarantees of waste.

After thriving for 12 years under the protection of government offices, public data processing related bodies have been reorganized and some of them have been dissolved.

Contracts from government offices and major government programs, until now the responsibility of the Data Processing Agency and the Commission of Data Processing, are now becoming available to data processing services and engineering companies.

25044/9738
CSO: 3698/A020

CSRT EVALUATION OF FRENCH INDUSTRIAL R&D

Paris POLITIQUE INDUSTRIELLE in French Autumn 1986 pp 83-101

[Article by F. Kourilsky: "In Support of a New Industrial Research Policy"; Mr Kourilsky, M.D., 51 years old, has been vice president of the Higher Council on Research and Technology (CSRT) since 1983. He founded INSERM [National Institute for Health and Medical Research]-CNRS [National Center for Scientific Research] Immunology Center in Marseille-Lumigny and was its director from 1976 to 1985. First paragraph is POLITIQUE INDUSTRIELLE introduction.]

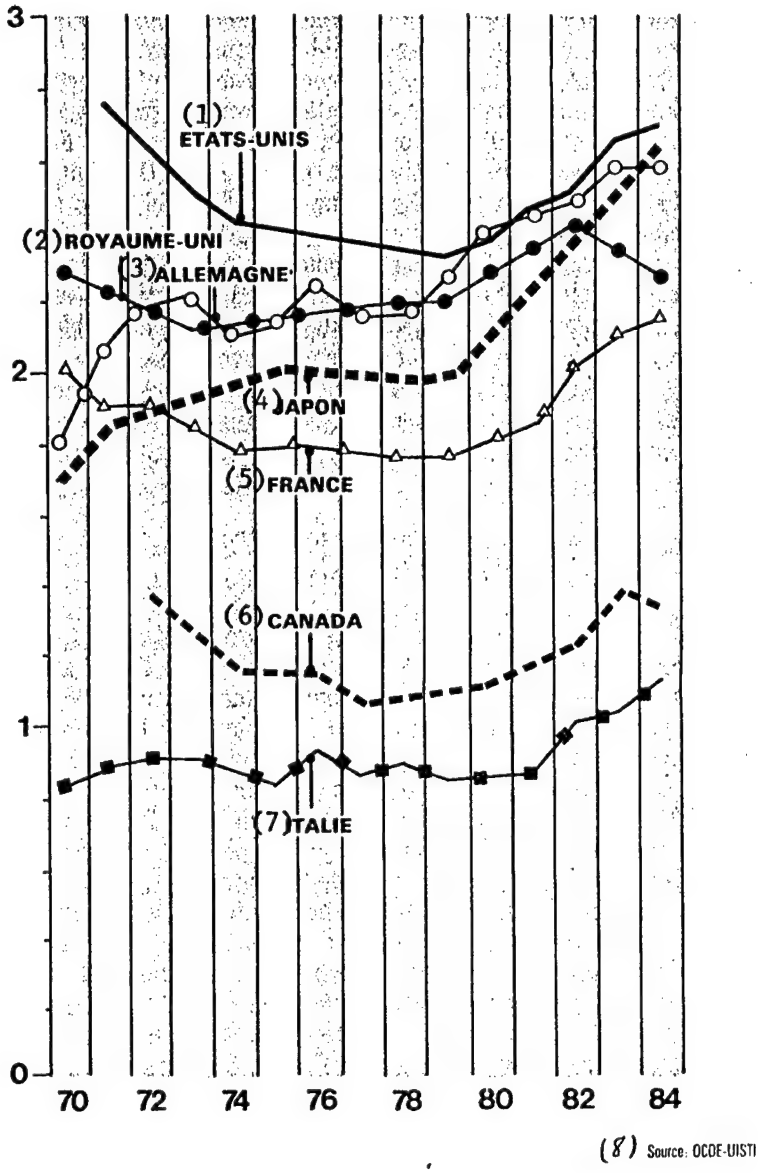
[Text] The R&D effort remains inadequate, concentrated in too few companies and industries, and supported by an even more concentrated government effort. However, there are still resources for making industrial research a national priority.

For all developed countries, economic development requires an increasing technological innovation capacity in order to confront very active international competition. In the 1960's, France ranked third worldwide in research and development (R&D), as measured by expenditures. It was surpassed by the FRG in about 1970, and then by Japan. A turnaround in the French R&D effort began in 1979, and it has picked up since 1981 (see Figure 1). Since most of its competitors did the same, France has not regained its leading position, but at least it has not lost any more ground

The R&D effort includes R&D by companies and government and public agencies. Industrial research experienced accelerated growth in the early 1980's, leveled off in 1983, and then tended upward again. However, the relatively small role of companies in conducting and financing R&D is and remains a worrisome characteristic of research in France, compared to other developed countries. The CSRT and the Research Planning Commission therefore consider the revival of industrial research an absolute priority for the end of France's 9th [Economic] Plan. Indeed, this priority was clearly stated in the second 1985 law on research (1986-1989 3-year plan).

Following the abrupt drop in public funding for research and technology in 1986, industry must prematurely assume responsibility for maintaining the growth of the French national R&D effort. Will it be able to do so? The situation is troublesome. But neither the state nor French industry have yet used all their options....

Figure 1: Total R&D Expenditure as Percentage of GNP



Key:
1. United States
2. UK
3. FRG
4. Japan
5. France
6. Canada
7. Italy
8. Source: OECD-UISTI

Technology, Innovation, and Research

The explosion of scientific discoveries and technical innovations with their heavy impact on industry and society did not happen just yesterday. On the contrary, attitudes towards the role of science and technology in industrial development have changed over time. Thus, after the frenzied development of the 1960's, the general disenchantment of the post-Apollo period was summarized in 1969 in the statement: "Science has proved disappointing." Ten years later, the scene had changed. Analyses of the structural causes for the economic crisis of the 1970's converged. Development of transportation and communications, accelerated technological change, the worldwide interdependency of markets, and establishment of bodies with international jurisdiction brought about new attitudes. These attitudes encouraged states to view technological development as necessary for preserving the competitiveness of their industry. Technological development depends on the capacity for technical innovation, which, in turn, is partially linked to R&D activities.

Let us refrain, however, from overrating the role of science, which is sometimes greatly exaggerated by the media. Scientific research is only one of the roads to technological innovation. The OECD states it well (1): "Science does not necessarily precede technology and is not its sole source. Technological development has many sources, and we must guard against their depletion." Technology develops independently in each sector and industry, even in each company. Creativity, culture, training, employee motivation, industrial and commercial environment, exchanges, cross-fertilization, etc. are fundamental factors. Technological development does not depend on the development of research activities alone. On the contrary, in the absence of these activities, the innovative capacity is inexorably extinguished.

Is France an innovative nation? Having posed this question, Christian Marbach replies in the affirmative: "A shining past, an uneven but often brilliant present."(2) Jean-Jacques Salomon is far more critical (3). In the OECD's opinion, some industrial sectors stand up to international comparison, but technological weaknesses in broad areas weaken the system as a whole. These weaknesses are at the root of the severe criticism leveled at the overall technological competitiveness and innovative capacity of France. Thus, the 33 indicators used by the European Management Forum to measure innovative power in OECD countries caused France to slide from the 9th to the 13th position between 1980 and 1985, and even to the 19th position if non-OECD countries are included. The capacity of French companies to upgrade their production techniques and benefit commercially from their inventions receives a very poor rating. More objective though equally controversial indicators covering patents and licenses are hardly more favorable.

These criticisms are too general to be genuinely significant. But let us note that conditions favorable to technological innovation are not found in all French industrial sectors.

The Position of Industrial Research in France

Still, French management has a supportive, although critical attitude towards the development of research and innovation. According to a recent poll

(Ifres-Groupe Monome-Francom, June 1986), 70 percent of high-level managers mentioned the adoption of new technologies when asked to list the areas in which companies need the greatest improvement. In the February 1985 ICSP-RES poll by L'USINE NOUVELLE and IVI-FO, most managers thought that innovation should be a responsibility of companies. Companies were considered relatively inactive, but receptive to research development.

In accordance with the Frascati Manual we will consider industrial research to mean research conducted by private or nationalized companies, regardless of whether it is directed fundamental research, applied research, or experimental development.

Technically, this definition of industrial research excludes technical research for industrial purposes when it is carried out mainly by public organizations for finalized research, or by universities or engineering schools.

In considering the place of French industrial research, certain characteristics of the public sector of French research must be kept in mind.

- First of all, military research occupies an important position. In 1985, it cost about Fr 21 of the Fr 69.5 billion spent in public research (out of total national R&D expenditures of about Fr 104 billion). France can thus not be compared to, for instance, the FRG or Japan.

- On the other hand, France's public research sector is uniquely characterized by the considerable role of major research organizations, as compared to universities. These centralized research organizations employ over 60,000 persons and have become the spearhead of French research. They specialize in basic (CNRS, INSERM, etc.) or applied (INRA [National Institute for Agronomic Research], ORSTOM [Overseas Scientific and Technical Research Office], INRIA [National Institute for Data Processing and Automation Research], etc.) research, or have an industrial and commercial approach (CEA [Atomic Energy Commission], CNES [National Center for Space Studies], CNET [National Center for Telecommunications Studies], etc.).

In contrast to the situation in the United States or the UK, there are few French organizations which still act as an "agency" (characterized by outside funding and limited staff), such as AFME [French Agency for Energy Management], ANVAR [National Agency for the Implementation of Research], CNES.... In reality, most of them are self-supporting.

- Finally, university and research organization employees have civil servant status. In my opinion, relations between public research and the industrial sector are affected far less by stable employment practices (found in many countries, especially Japan) than by the rigid rules of the French civil service.

Findings

An examination of industrial research in France leads to several findings:

First finding: Company participation in R&D financing in France is very inadequate (Table 1):

Table 1

Country	1979	1980	1981	1982	1983	1984	1985
France	60	60	59	58	56.8	57	(57)
FRG	69	69	68	69	70	70	(70)
UK	64.5	64	62	64	64	63	(64)
United States	58	60	61	62	63	64	(64)

Sources: OECD and MRES

In comparison to its five major competitors, France stands out as the country in which industry's share in research funding has been and remains the smallest. In 1984, it was 43 percent of France's total R&D effort. The same year, it was 46 percent in the UK, almost 50 percent in the United States, 58 percent in the FRG, and 66 percent in Japan.

French industry's research funding deficit has been estimated by some at Fr 25 billion! Such speculative estimates are of interest mainly to show that this imbalance cannot be corrected in a single year.

Second finding: The participation of French companies in R&D activities is inadequate.

Here again, France stands out as the country in which industry's participation in R&D work is smallest (57 percent in 1984, compared to 63 percent in the UK, 64 percent in Japan, 70 percent in the FRG, and 72.6 percent in the United States). The downward trend which worsened after 1974 seems to have reversed itself slightly since 1984, as shown in Table 2:

Table 2

Country	1979	1980	1981	1982	1983	1984	1985
France	44	44	42	43	43	43	(43.5)
FRG	55	54	57	57	58	(58)	(58)
UK	46	46	45	46	46	(46)	(46)
United States	46	48	49	49.5	49.5	49.8	(50)
Japan	59	61	62	64	65	(66)	(66)

Sources: OECD and MRES

Third finding: The public sector is not excessively developed; industrial research is indeed inadequate.

It would be almost reassuring and ever so comforting if we could attribute the imbalance between public and private research to overdevelopment of the public sector in France! But this is not the case.

For instance, R&D expenditures by public agencies equaled 1.26 percent of the GNP in 1985. This is close to the average (1.20 percent) observed in the five other countries studied, and below the figure for the United States (1.40 percent) and the UK (1.35 percent) (4).

Similarly, the manpower deficit in French industrial research appears insurmountable. In 1984, some 138,000 persons, including 41,500 researchers, participated in industrial R&D. This is 14 times fewer researchers than in the United States, five times fewer than in Japan, and one-half as many as in the FRG and the UK (5). While these figures should be accepted cautiously, they nonetheless attest to an overall shortage of researchers and engineers in the French labor force, with 3.7 per thousand employed persons, compared to 4.7 in the FRG, 6.2 in the United States, and 6.9 in Japan (6).

Fourth finding: French industry has continuously increased its research effort since 1979.

For instance, French industrial R&D's share of the total GNP increased to 1.18 percent in 1981, 1.22 percent in 1983, and 1.28 percent in 1984. The modest performance suggested by the preceding findings is therefore not due to any lack of interest in research on the part of business. Far from it. It must be viewed within the context of the business environment of the period. R&D investment continued despite falling investment capacities, although it was limited to certain sectors (5).

In summary, although French industry is in fact stepping up its R&D activities, industry participation in the performance and financing of French R&D remains the weakest among all its competitor countries. Overall, French industrial research is considered "lagging," "inadequate," etc., but these general assessments are not valid for all branches.

Causes

The situation seems particularly worrisome to me because it reveals the national research effort's insufficient attention to industrial applications. This fact should arouse officials both in business and in public research organizations. Is the inadequacy of technical research in France, including its limited role in the universities, the symptom or the consequence of its limited contact with the market?

In reality, the picture is distorted by the general assessments mentioned above. In concentrating too much on the whole, one fails to see the details. Statistical averages are valid only if the data are homogeneous, but industrial research in France is a mosaic of contrasts with brilliant activities here, mediocre ones there, none at all elsewhere. Industrial R&D is highly concentrated, almost entirely confined to certain sectors, areas, and companies. This concentration can be considered at several levels:

1. Research is concentrated in a small number of companies.

The number of companies conducting ongoing research, and employing more than one full-time researcher is very small: 1,300 in 1982; 1,350 in 1983; 1,600 in 1984 (including professional organizations and technical centers). True, these punctilious figures (4) do not include companies which occasionally conduct research, nor the thousands of innovative companies which conduct none at all. But this small number of "researching" companies accounts for 40 percent of all industrial employees and more than 50 percent of national production. Large companies predominate here, as in all major industrialized countries. In 1984, more than half of total industrial R&D capacity was concentrated in the nationalized companies (58 percent of expenditures, and 55 percent of personnel) representing the greater part of its growth since 1980. By comparison, private companies represent about 39 percent of R&D capacity, and professional organizations, 3 percent. It will be up to small- and medium-sized businesses to achieve a better distribution of industrial research. These businesses are already becoming actively involved.

2. Industrial research is clearly concentrated in certain areas.

Thus, six areas (electronics, aeronautics, automobiles, chemistry, pharmaceuticals, and energy) account for three-fourths of companies' R&D capacity. In contrast, research is poorly developed in some traditional sectors despite their economic importance (mechanical engineering, textiles, food and agriculture industries, construction, etc.). The contrast in R&D expenditures is even greater when considered by individual sector. For instance, as a percentage of the value added, aeronautics and pharmaceuticals spend more than 30 percent on R&D; the agricultural and food industries, 0.3 percent, while the average for all areas is 2.8 percent.

This concentration of R&D activities in certain industrial areas which are more "scientific" than others is also encountered in all developed countries. Still, research activities appear better divided and distributed in other countries. Here again, France stands apart.

3. Public funding is even more concentrated.

Most public funding for industrial research (a total Fr 12.4 billion in 1984) is concentrated in the nationalized sector (79 percent) and in two areas: aeronautics (50 percent) and electronics (32 percent). Consequently, the share allotted to most other areas is very small, on the order of 0.1 percent (automobiles, pharmaceuticals, textiles, construction, agro-foods, etc.).

The fact that the state directly finances 52 percent of the R&D budget of companies in aeronautics and 32 percent in electronics, but only 0.5 percent in the pharmaceutical industry, 2 percent in automobiles, and 4 percent in the agro-foods industries (4) is explained by the source of public finding: More than 75 percent of the funds come from the Ministry of Defense.

This concentration of public funding does not help to correct the concentration of industrial research. On the contrary. The public funding incentives

are particularly lacking in certain industrial areas which are poorly prepared--for structural, economic, or psychological reasons--to enter into R&D activities on their own (agro-foods, construction, textiles, metallurgy, etc.). Knowing that 90 percent of public funding goes to about 100 companies, the extent of its motivational effect on industry can be surmised!

4. Has the French technology effort become too concentrated on the major state programs?

Does the state intervene too much in industrial research, or not enough? In a country in which industry and the banks have traditionally been considered mutually distrustful, state intervention is welcome and even effective, at least if it does not become a habit.... However, the interventionism--indeed, the dirigisme--of the French Government has not succeeded in dragging all of industry down the road to technological development. In fact, the state has concentrated mainly on the major programs of national and often military interest. France excels in such programs, as proven by its technological successes in nuclear power, aeronautics, and space

In a caustic report (3), J.-J. Salomon justifiably stressed certain negative aspects of what he calls the "arsenal strategy." He denounces the government's traditional support and its methods of intervention in the major programs connected to captive markets where the state is the customer as a far-reaching weakness of the French system. Expansion of this strategy is stifling R&D incentives in sectors active in competitive markets basic to the economy. A EUREKA-type program would probably be immune from this analysis.

What are the strengths and weaknesses of the major programs? The strike force of French research and technology, these programs seem to encourage concentration rather than distribution of technology throughout industry. The Plan Commission and the CSRT strongly recommended that an increased share of public funding go to "distributed" industrial research, shifting from the major traditional programs toward "diffusing" technologies, thus benefiting several industrial sectors.

Research Capacity

Faced with this difficult situation in industrial research, one need not sink into the bitterness of typically French pessimism. On the one hand, the economic environment which has handicapped company efforts over the past few years now shows favorable trends with increasing growth and renewed investment capacities. On the other hand, several announced measures have not yet been appropriately implemented, and others have not yet had time to take effect.

- Thus, the remarkable entry of the regions into research activities can bring about profound changes. The regional councils have increased their overall funding of research and technology by 150 percent over 3 years, mostly for technological purposes (regional centers for innovation and technological transfer, technological coordination, etc.). The dynamic relationships

between research and industry are more efficient on the regional level and can bring about far-reaching changes.

- Tax incentives for industrial research in France have been limited to the research tax credit. It has already had positive effects, but the analysis made by Iona Dimo for the CSRT (5) reveals their limits with respect to time and company. The professional tax burdens research activities which, after all, do not produce results immediately. Measures concerning venture capital remain tentative. In other countries--such as the United States, Canada, and Japan--tax incentives for research target far more specific goals.

- Direct economic incentives for industrial research in France are so out of balance that they can only be improved. Manichean attitudes which pit tax incentives against direct funding, automatic aid against targeted aid, are too often stamped by dogmatism. Public funding must be adapted to the desired goals. The clear objective is to stimulate research and development activities in areas and companies in France which are now poorly prepared to take the initiative. Direct incentive credits aimed at these industrial sectors (see above) and at small- and medium-sized industries and companies are indispensable for the time being. One cannot hope to change the future by perpetuating the tradition of financing major programs and very large companies almost exclusively.

The 1986 cancellations which affect 40 percent of these incentive credits were, in my opinion, a serious mistake with long-range consequences. Funding incentives should be increased and directed at specific industrial branches and spreading technologies, and should promote cooperation between public research and industry.

Certain assets have not yet been used to advantage and any measures taken must overcome people's stubborn reticence and habitual behavior. Let us look at three examples:

1. Engineer training through research

The CSRT has pointed out a little-known flaw in French industry (7). In France, industry traditionally recruits its staff from the engineering schools and takes few university graduates. The division between engineering schools and universities has resulted in the very small number of engineers trained through research. In 1980, for example, only 5.2 percent of the 10,600 engineers had a 3d-cycle doctorate degree. Compared to its neighbors, the French position leaves much to be desired. Could this perhaps be a deep-seated sociological explanation for the difficulties of certain industries to participate in research?

Solutions have been applied, but without fully addressing the problem. The introduction of research into engineering schools has gingerly increased. Relations between universities and engineering schools are still at the flirtation stage. Industry's traditional mistrust of university graduates has not evaporated, and university pride does not always permit university officials to court businesses in order to promote and "sell" their "product."

The model of the IUT's [University Institute of Technology] has not yet done its job....

The cornerstone of the proposed reform was the introduction of a short thesis requirement. One year after its creation, this new American-style thesis disappeared with the Savary law. However, the former state thesis was poorly regarded by business and must be replaced. Unless perhaps its poor reception was due only to poor promotion?

2. Technology implementation and transfer

A major step was taken when research organizations and universities were given the responsibility of disseminating their research findings and assuring their implementation. As a matter of fact, enormous progress has been made, in particular in certain research fields previously uninvolved with industry (for example, biology at INSERM and CNRS). Much remains to be done to improve and adapt these new efforts to the needs of industry. Information on these activities is still incomplete (5). Thus, decentralization is desirable, since in an active exchange between scientists and industry, a central power acting as an intermediary can effectively complicate procedures, slow down agreements, and even oscillate between the role of "middleman" and that of "policeman." On the other hand, the proper balance between the implementation of research findings by the public sector and the response of public organizations to specific industry requests has not been found yet. Mechanisms for cooperation between public laboratories and companies remain to be defined. The new public-interest-group (GIP) approach still seems to be bogged down in sluggish ministerial approvals, hiring constraints, and mistrust of financial control.

Public organizations must still adapt to the new procedures for cooperation with industry. Industry funding of labs is still too often unpredictable. The hiring of temporary staff causes uneasiness. Most of all, ethical guidelines are needed for determining how the organizations should charge for services rendered: Should such charges include salaries? Businesses are justified in not agreeing to pay a heavy price to public laboratories which they already support through their taxes.

Technology transfer from the public sector to industry still requires many adjustments for greater efficiency. In particular, technology transfers from major state-funded programs should better benefit industry as a whole (5). The stimulation of industry by the public sector also poses the problem of subcontracting procedures involving major programs. In the nuclear field, the AEC [Atomic Energy Commission] subcontracts only a small portion of its activity to the private sector because of the extensive role of the organization itself and its subsidiaries. In space, the CNES subcontracts a major part of the programs, but subcontracting is accused of being controlled by international agreements.

3. Employee mobility.

A recent CSRT report (8) reveals the very low employee mobility in public research. If we include not only resignations, but also temporary transfers

and loans, the mobility rate is in the single digits or a few tens per thousand, depending on the organization. There are many well-known causes for this: different social and cultural backgrounds, university curricula "protected" from contact with industry, engineering curricula deprived of contact with research, attitudes of scientific evaluation agencies, and ineffective human resources management systems in the public sector.

Numerous measures have been taken for temporary transfers or loans of scientists from the public sector to industry. Still, practically everything remains to be done. Some long-denounced obstacles still exist: The Ministry of Finance refuses to authorize a scientist's transfer to industry if he is offered a salary 15 percent higher than his former salary; if a professor resigns, there are no arrangements for his retirement fund to be transferred to his new employer's fund, etc. The personnel departments of government agencies (where the term "human resources" is unknown) must undergo major reform. The head of a large company told me that he would certainly not have succeeded in luring a single executive if his personnel management were organized as in public organizations. The problem of mobility has been discussed for 20 years. The CSRT's conclusion: "Stop talking about it and get on with it." This requires a genuine psychological effort, not only among scientists, but also among research administrators.

Let's Change Planning

Civil service status represents a new factor which may encourage "safe" mobility. Very different situations exist. For instance, while mobility is absolutely necessary for the promotion of university professors, nothing in the status of research personnel requires it. A major drive to promote human factors over rigid civil service rules could substantially increase movement.

Finally, the idea of mobilizing entire teams from the public sector to strengthen industrial know-how as was the case with the AEC, for instance, is still stalled.

I find it surprising that attitudes toward industrial research in France have evolved far more slowly than the rate of its technological change. Given research and technology's value to industry, they deserve well adapted methods and approaches on a national level. While political actions are fortunately only temporary, this question merits on-going study. Urgency, however, is an incurable disease of ministries. When making a decision, consultation, impact studies, and data acquisition take a lot of time! Without prior studies, plans could easily be based on mere beliefs and impressions. It seems to me that the importance of industrial research imposes a certain continuity in observation, study, and evaluation, involving at least scientists and manufacturers, to constantly provide a rational and pragmatic base for political decisions.

If we analyze the recovery period of the national R&D effort (1979-1985), we note the obvious growth of industrial research as a basis for French technological development. However, it seems that analyses and studies on the most appropriate means for research development were not available. Thus, when it

was finally noticed in 1984 that efforts by companies had trouble keeping up with the national R&D effort, time had been lost.

Did industrial research thus forfeit the unique opportunity represented during this period by an explicit political desire to revitalize French research and technology? I do not think so, because the stakes remain high. The first priority consists in organizing a system for on-going national study of industrial research, which must be periodically updated with current data. France's special characteristics are too strong for France to be able to base its policy on foreign experiences. The responsibility of industrial research planning rests with the industrialists themselves and with their professional organization. Indeed, nothing predisposes the ministries to expert analysis in this field. At the very least, observation and analysis of the French industrial research system within the international context must develop branch by branch and sector by sector.

Several suggestions can be made to help develop methods and mold political thought in this field:

1. Organize planning tools

- The tools of observation and statistics are very poorly developed in France, in contrast to the United States. This weakness has been deplored for many years, but has still not been corrected. One of the positive aspects of the public grants from ANVAR and, later, of the tax credit was the increased awareness within companies of innovation and research. Monitoring indicators and studying research developments in the various branches, etc. require a stable national organization. It can be set up without delay.

- The tools for on-going planning, uniting professionals, industrialists, and scientists, can begin immediately. Too often, research and technology planning groups are overly confined to the public sector, where industrial research is not sufficiently considered. Long-term planning is also restricted to the public sector. An increase in the small number of existing groups would have the further advantage of increasing the desired exchange among experts from various sectors.

2. Take advantage of the special characteristics of the French research and technology system

Despite the many international comparisons, the French system, with its strengths and weaknesses, is alive and well. A measure which works miracles elsewhere may prove disastrous in this country. French creativity can use the quirks of its own culture. The "policy of reduced models," which applies American or Japanese solutions that have seduced a French official during his latest trip, is hardly more intellectually satisfying than a "stopgap policy" which justifies reinforcement of a sector because it is "behind."

3. Unify all technical research policy.

"Technical" research is conducted in both the public sector and the industrial sector. In today's France, it is no longer thinkable to administer one policy for industrial research and another policy for technical research by the public sector. While it may still, perhaps, be possible to consider "basic research" and "industrial research" separately, current interaction between the private and public sectors and the heavy involvement of major state organizations in technological development make it necessary to maintain an overall view of research and technology.

4. Restore credence in the value of practical experience.

By this I do not mean that the ideas of government authorities are always out of step with practical reality. Still, the theoretical validity of a hypothesis is always tested on the job. Biology shows us the great variety of conflicts between logic, faith, and the chaos which surrounds us. So let us continue to listen to the real world.

5. Recognize time scales and plan for the long term.

This is probably the most difficult thing. In research, time scales do not coincide with the scale of political life. Five to ten years are needed to set up a competitive lab in industry as well as in the public sector. The effects of industrial research measures taken in 1986 will not be felt before 1988. This means that a research and technology policy is poorly suited to sudden about-faces. Governmental instability under the Fourth Republic has been followed by frequent ministerial changes under the Fifth. Since 1982, research has therefore had four ministers in 4 years. Recent experience confirms that neither plan nor legislation can guarantee continuity in case of a change of government. The 3-year plan was thus given a new orientation in 1 month in April 1986, even before the new minister had time to study the files.

Proposals for an Industrial Research Policy

On a diagnostic level, both French and foreign experts and observers attribute characteristics of strong support to French research and technology as previously mentioned.

Some general principles emerge from these findings:

- The development of industrial research and technology must be a national priority.

- Revitalization of industrial research must logically be supported by the public research sector, which may, in fact, be its major asset.

Fundamental research in the public sector, coupled with its high quality, can provide substantial upstream support for training and for the knowledge needed to manage technology.

Above all, public organizations conducting end research, most of which are somewhat out of touch with the work of companies, could better use their research capacity and diversify their support of industrial firms.

- Development of industrial research by reducing the public sector would be a grave mistake. Since this sector is not overdeveloped in France (see above), national R&D capacity would thereby be hobbled. On the contrary, industrial research must be developed more rapidly than the public sector, or the current imbalance will worsen.

- In revitalizing industrial research, it would be unreasonable to rely too heavily on the public sector, which is unaccustomed to working with companies and which has no greater activity in many areas than they do.

- Above all, development of industrial research requires activity-specific incentives, carefully adapted to prevailing conditions.

- In particular, distribution of R&D activities has become urgent: Research by large nationalized companies must spread to the private sector (especially small- and medium-sized industries and companies), with efforts shifted from areas where such movement is already strong into branches where it barely exists. The concentration of public funding and its preference for major technological development programs may be reduced.

From these comments, one can draw the few principles of a growth policy for industrial research. This policy must be based, first, on considered support of R&D development in companies, with preference given to certain branches, and second, on the organization of increased interaction between the public research sector and industry. These recommendations, put forth in several circles, were taken up by the CSRT and have become almost banal or even ritual. While they are indeed cited with a more or less discernible degree of conviction in the speeches of most politicians, regardless of party, the steps to be taken are, nonetheless, the object of sometimes strong disagreement.

Ideally, any possible measures for application of these recommendations should first be subject to close examination by experts in the field, a speedy impact study, and finally, to regular monitoring of their implementation and their initial effects in the field. This is not always possible. Still, many consider inaction or delay preferable to a measure which is poorly implemented or inapplicable and which masks the urgency of the problem; or worse, an inadequate measure which may have horrible results.

Much has been accomplished over the last few years, and the stated intentions have been incorporated into many measures since 1981. Some have already produced positive results. For instance, we can note the stimulating effects of the research tax credit, and the positive effects of increased ANVAR aid, subject to further evaluation. Similarly, in organizing the research organizations' new role in promotion and information, contacts with industry, established after the Researchers' Congress in 1981, have been expanded. This trend has been reinforced by training programs (CIFRE) and certain national programs.

In the absence of preliminary impact studies, it is reassuring to note the place of pragmatic trial-and-error method. The changes in orientation cannot, however, be ascribed to any one short-termed minister. Jean-Pierre Chevenement, credited with having launched the research movement and most of its ideas, underestimated industry's ability to join in the national R&D effort. Laurent Fabius especially emphasized grants for fully integrating research into a company's strategy. Although unable to manage certain development programs with a strong industrial component, such as the filiere electronique [program for development of computer-related industries], Hubert Curien was given the task of reorienting the first law on research and technology (1982) by drawing up the 1986-1988 3-year plan. This plan contains several measures giving priority to broad-based industrial research. However, from the very first year the nonmilitary budget lost further ground, to the benefit of major programs through the space program.

Under the Chirac government, Alain Devaquet will have a more difficult job, since he no longer controls budget allocations for his department. This privilege was (temporarily) withdrawn by the Budget Ministry which reasserted its prerogative. Nonetheless, some public technical research was supported by his ministry's budget, especially the major part of AEC and CNES activities. Since April 1986, cancellations of budget allocations selectively reduced funds destined for widespread industrial research through ANVAR (40 percent) and the Fund for Research and Technology. It is not certain that any single minister remains able to conduct a national industrial research policy. We must reestablish a base for coordination.

France's industrial research policy is currently confronted by three major challenges:

1. Will France prove itself able to extend its industrial research development into competing sectors not covered by the major programs? Would these programs be less burdensome if they received more European support?

2. Will France succeed in giving end research organizations a new role in their dealings with industry?

3. Will France succeed in adapting the centralized operating procedures of its public research organizations to extensive interaction between laboratories and companies?

Many other basic questions arise, especially if industrial research is considered as part of companies' development of technical innovations, rather than as an isolated phenomenon as I have done here.

In conclusion, without being unduly optimistic, it is reasonable to assert that neither the state nor companies have used all their assets yet. There is still room for innovation.

NOTES

1. OECD, "Examination of the Innovation Policies in France," January 1986

2. POLITIQUE INDUSTRIELLE No 2, p 27

3. Jean-Jacques Salomon, "The Gaul, the Cowboy, and the Samurai," CPE Study No 61, July 1985

4. "Research and Development in Companies. 1984 Results," MRES, 1986

5. "Annual Report on the Evaluation of the Technological Research and Development Policy," CSRT Report, 1986

6. "Employment of Scientists in Research in France," CSRT Report, 1986

7. "Engineer Training Through Research," Proceedings of the Seminar of 7 November 1984, CSRT 1986

8. "Brakes and Engines for the Mobility of Public Research Personnel," CSRT Report, 1984

25053/13046
CSO: 3698/A049

FINNISH NOKIA, SALORA, MOBIRA INTERESTED IN RACE

Helsinki HELSINGIN SANOMAT in Finnish 22 Nov 86 p 37

[Article: "Finland May Be Late for RACE Project"]

[Text] The possibilities that Finnish companies will be included in the first phase of the RACE Project of EC [European Community], starting at the beginning of next year, may be endangered. At least this is what Ville Hentinen, manager of Nokia Oy's Research Center, is concerned about.

The name of the RACE Project comes from the words Research and Development in Advanced Communication Technologies for Europe. The project aims at developing a telecommunication network extending over all of Western Europe, a so-called wide-lane network, based on using optic fibers. The network would enable simultaneous transmission of voice, picture and data.

The 18-month preliminary study phase of RACE has ended and the first phase will be started, in which a network and associated equipment will be built as an experiment.

In addition to Nokia Elektroniikka, Salora and Mobira, subsidiaries of the concern, are interested in the project. Some other electronics companies also would like to be involved.

Although the project was initiated by EC, it is essentially open to European countries outside EC. Finland, among others, has expressed its desire to be included, but so far the mixed commission between EC and Finland has not made a decision about the forms of participation.

In Finland, the project is administered by TEKES, i.e. Technological Development Center. According to Hentinen, TEKES has actively promoted the issue and cannot be blamed for the delay. Besides Finland, other EFTA countries are in the same situation, except Norway, which is supposed to have received a special permit.

Hentinen considers the reason for the delay to be simply the bureaucracy of EC, not known to be among the easiest.

Although the project will be implemented under the supervision of the EC Commission and countries, in practice, it is based on the collaboration between the companies. The companies wishing to be included have to name the sub-projects in which they wish to be involved, and the sub-projects are then divided between several companies for implementation.

The EC Commission has set the rule that there must be the minimum of two companies from the EC countries in each sub-project.

TEKES is currently compiling a list of the Finnish companies interested in RACE and their areas of interest, even though the detailed program of the first phase of RACE is not fully known yet.

Nokia Interested in Centers and Transfer Roads

Hentinen hopes that the Finns could, for example, receive a special permission to be included as soon as the project starts next spring. Hentinen believes that it would be difficult to be included after the project has begun and the most interesting areas will then have been reserved.

The first phase is one of the most important parts of the project since it involves the development and testing of the equipment.

Nokia is interested in developing centers, transfer roads and subscriber equipment within RACE. Becoming involved takes time, however, since two cooperative foreign companies must be located for each sub-project and the tasks have to be divided between the parties concerned.

According to Hentinen, RACE is a very important project for Nokia, even if it is a project with only long-term rewards.

The first phase, now to begin, will be completed at the beginning of the 1990's when the test systems should be made to work. The project is expected to generate economically significant activities around the mid-1990's.

The monetary value of the markets which will be born at that time will be large, even though there can now be only speculation about the demand for the services.

12956
CSO: 3698/131

BRIEFS

MITTERRAND ON FRENCH RESEARCH POLICY--Montpellier--President Francois Miterrand emphasized last 4 November in Montpellier the importance of "public policy" in scientific activity adding that "a country that makes research a priority is sure of preparing for the decades to come. Without intending to be controversial, I feel that it is a national obligation," he observed, while the Parliament is in the process of debating the research budget. The head of state, who came to Montpellier to visit the Euromedicine 86 International Show, stressed the important role of the administration in terms of scientific and medical research. "The government must be there, attentive and modest, without attempting to substitute for private initiative, but accompanying all the activities which cannot be acocmplished without its assistance," he remarked. Mr Mitterrand also emphasized the importance of decentralization laws, voted in at the beginning of his seven-year term, which are not "a simple administrative reform, but rather a profound change giving coherence to a project of society. Decentralization, applied to a national policy, has yielded results. If we want France to be a first-class economic and social power, this effort must continue," he said. [Text] [Paris AFP SCIENCES in French 6 Nov 86 p 1] 13146/12624

PHILIPS CALLS FOR S&T BUDGET INCREASE--Drachten--Philips boss C.J. van der Klugt recently indicated what Philips thinks the Netherlands Government's S&T policy should be; Eng F.C. Rauwenhoff, also of Philips, recently cited the amounts involved. Rauwenhoff, board chairman of Netherlands Philips,BV, recently mentioned the amounts at a meeting of the Netherlands Christian Employers Association (NCW). He urgently requested an S&T policy budget increase of 400 to 600 million guilders. Rauwenhoff said he was therefore disappointed by the government's intention to cut the Ministry of Economic Affairs' budget by 500 million guilders. He fears that at least half of this amount will have to come from the various S&T budgets. This will result in about a 750 million guilder gap between the "supply and demand" for subsidies; and this at a moment when the Netherlands Government's financial support to industrial development is already lagging far behind that of competing countries, according to Rauwenhoff. [Excerpts] [Amsterdam COMPUTABLE in Dutch 7 Nov 86 p 2] 25048/9835

CSO: 3698/A063

BRIEFS

SIEMENS SALES IN PRC--Siemens has recently won the largest computer hardware contract every signed in China. The contract involves delivery of 18 large computers for use in technical universities, advanced technical schools, and research institutes located in 11 cities including 8 provincial capitals. The contract is worth DM50 million and involves the delivery of 18 7570-C computers with the BS-2000 operating system, 755 terminals, 19 CAD graphic systems, and 36 PCMX-2 personal computers with 112 workstations with screen. For the input and output of the 7,000 characters of the Chinese alphabet, Siemens delivered 36 PC-16 personal computers along with laser printers. In addition, the German company is to train over 70 Chinese specialists. [By Patrick Haa--The computers will be used primarily for teaching and research in the areas of electrotechnology, design, mechanics, construction and public works, geodesics, and geology. This contract, won in competition with American, Japanese, and European companies, brings the number of BS-2000 systems installed in China to more than 30] [Excerpt] [Paris ZERO UN INFORMATIQUE in French 22 Sep 86 p 6] 25006/12232

CSO: 3698/A011

BRAZIL TO FINANCE SOFTWARE RESEARCH

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 23 Sep 86 p 10

[Text] By the end of the week small, very small and medium-sized "software houses" will be able to present requests for financing to the Funding Authority for Studies and Projects (FINEP) for research and production of basic software, supporting software (except that used to generate data and reports) and programs for scientific and industrial applications. The Software Support Program of FINEP, an agency of the Ministry of Science and Technology, hopes to finance between 40 and 50 firms per year, providing some 50 million cruzados (an average of 1 million cruzados per project).

In the first, experimental phase of the program, which took place during the first half of the year, some 200 firms requested information from FINEP, with 40 actually presenting projects. Of these, only 18 firms intended to develop software in accordance with the priorities of the program. But only 4 of the latter obtained financing--Simicron, Minimicro, Humana Informatica and Microbase--for a total of 3 million cruzados.

Rodholfo Badin, of FINEP, relates that "there are certain priority criteria for the approval of financing, which aim to promote the establishment of projects in these areas considered most lacking, according to the policy established by PLANIN (National Plan for Information and Automation)." A firm wishing to receive the financing will be required, from the beginning, to define its activities and the utilization of its capital (the program is aimed at small, very small and medium-sized firms), as well as the project and its methodology, which includes the language that it intends to develop and the type of equipment used (domestic or foreign). The firm must also provide the project's budget on the application.

Since the majority of software houses do not have the ability to offer real collateral for financing, FINEP requires personal guaranties. There are two financing options: In the first, the Program will finance 80 percent of the cost of the project, with the firm providing the additional 20 percent. The interest rate applied would be FINEP's lowest at the time (currently 3 percent annually). The second option would involve FINEP's sharing in the output of the firm, as a form of risk financing in which the return is calculated based on a percentage amount applied against after-tax revenue of the

firm. In this case the firm, apart from the interest, would have to pay a risk tax, normally limited to 20 percent of annual revenue. In Badin's opinion, this has been the "most convenient method for small enterprises, as it does not compromise performance." FINEP, however, according to a contractual clause, will have the right to participate in production technology decisions, even up to and including the salaries of the firm's personnel.

Badin emphasizes, however, that evaluation of the projects will take into consideration substitution of software imported on a wide scale, keeping in mind that the priorities of the program are in accordance with changes that are occurring in the microcomputer market, which tend to rely primarily on professional users, especially those with micros based on highly sophisticated chips.

Automation and Microelectronics

Apart from the Software Support Program, FINEP has announced the imminent establishment of the Industrial Automation and Process Control Program and the Microelectronics Research Promotion Program. According to Badin, the number of microelectronics researchers in Brazil is less than 100 (the size of a single research group in an American firm). For that reason the primary objectives of the Program will be the creation of human resources and production financing, which will require an "extremely large" investment of between $300 and $400 million (equivalent to the amount budgeted by PLANIN for 3 years).

With regard to the Automation Program, FINEP is currently looking for subsidies in the industrial sector, the DES and the universities, for the creation of policy directorates for sectoral support.

13026/7051
CSO: 3699/29

BRAZIL'S ELEBRA IN LASERS

Rio de Janeiro O GLOBO in Portuguese 13 Oct 86 p 20

[Article by Alzira Rodrigues]

[Text] Sao Paulo--Elebra Microeletronica will invest $3 million (41.5 million cruzados) in the construction of a laser products industry in Compinas, aimed primarily at the telecommunications market. Before construction of the new factory, however, which will begin within a month and will be completed in just over a year, Elebra will already be engaging in production, importing semi-finished products in order to finish the final phases of assembly and testing using Brazilian labor, thus constituting the first step towards domestic production.

Jose Ellis Ripper, Jr., Director of the Mircoelectronics Division of the firm, claims that the telecommunications market will begin to be supplied by laser products finished by Elebra by November or December, in facilities adapted for the purpose at the Campinas installation. He explained that within 12 to 18 months Elebra should be producing laser components in their entirety, importing only the material and equipment not available in the domestic market.

All this has been made possible by the fact that Elebra has been chosen by TELEBRAS as a suitable firm for acquiring laser production technology, following the example set by the ABC Group. Since the decision by TELEBRAS to sign the contract for the transfer of technology within 1 month, permitting them to charge royalties on the revenue derived from laser products, Elebra has already signed an agreement with the U.S. firm General Optronics to import semi-finished components.

Elebra currently distributes these products in Brazil through a contract held with the same General Optronics. Its plans for the infrastructure it has built in Compinas, which will initially employ 20 people, include producing some 20 different products, including laser components, LEDs (light-emitting diodes), and sensors. The telecommunications market consumes 3 thousand of these products annually.

"It is still a small market, but each component could cost hundreds, or in some cases thousands of dollars, since highly sophisticated technology is involved in the production of these products," says Ripper. The world price

of a laser product varies between $800 (11 thousand cruzados) and $6 thousand (83 thousand cruzados).

Apart from foreign manufacturers, only the Center for Research and Development (CPD) at TELEBRAS is supplying the domestic market, but this only in small quantity, from pilot-plant production. Elebra intends to increase domestic production as TELEBRAS technology is absorbed, which is predicted to occur in stages as the new facility in Campinas nears completion, when there should be 50 professionals working in the laser production field.

An important fact affecting Elebra's decision was the recent ruling by the National Information Council (CONIN) to partially exampt the microelectronics industry from the import tax. The exemption is 25 percent for imported finished products, 50 percent for semi-finished products (Elebra's present stage), 75 percent for processed inputs and 100 percent for raw materials and equipment.

In addition, the CONIN decision has extended the fiscal incentives provided for by the Informatics Law to firms which acquire these products.

13026/12851
CSO: 3699/28

TOSHIBA HOPES FOR NEW BRAZILIAN MARKETS

Rio de Janeiro O GLOBO in Portuguese 8 Sep 86 p 18

[Text] Toshiba International hopes to participate in two new markets in Brazil: informatics and industrial process control. Nobuyoshi Mori, the firm's president, has revealed that Toshiba is consequently performing a broad study to determine the best form of cooperation between Brazil and Japan in these areas, adding that the Brazilian facility will be headquarters for product development and manufacturing in Latin America, in addition to aiming at increasing exports.

In Japan, the firm invests massively in technology development in informatics, producing computers, copiers and office automation equipment. Toshiba spends $1 billion (13.84 billion cruzados) annually on electronic components production. Mori believes that the best way to lead the world rankings is to "actively introduce foreign technology when it is superior, without forgetting to permanently develop one's own technology."

Mori participated in the "Brazil/Japan--Industrial Technology" seminar sponsored by the Industrial Federation of Rio de Janeiro, where he spoke on "Energy and Electronics Today in Japan--The Strengthening of Relations with Brazil." He said that the greatest potential for mutual cooperation is in the field of high technology, which includes electronics, communications. refined ceramics and biotechnology. These disciplines, he added, require a great deal of human and financial resources.

The president of K. Inada Technologia, Koichi Inada, also participated in the event and noted that Japan is the country with the greatest potential for growth in terms of trade with Brazil, since it depends on raw materials for the manufacture of equipment and Brazil possesses aluminum, wood, steel, railroads, cellulose, leather, shipyards and other industries.

"In order to increase exports, the freedom to use electronic control systems is indispensable, as is access to modern equipment and machines, and good siting of industrial export facilities. These serve to increase productivity and quality and reduce overall costs," affirmed Inada.

13026/12851
CSO: 3699/28

ERICSSON, SIEMENS TO FORM JOINT VENTURES IN BRAZIL

Rio de Janeiro DATA NEWS in Portuguese 23 Sep 86 p 14

[Article by Carlos Thompson]

[Text] Sao Paulo--Proposals to create new enterprises from their Brazilian subsidiaries, which were presented to the SEI [Special Secretariat of Informatics] by Ericsson about a month ago and by Siemens 15 days ago, have not yet received an answer. Since it is known that both firms have provided details of shareholder composition, which is a requirement of article 12 of the Informatics Law (70 percent of stock must be held by domestic firms), the impass must be due to factors related to technological control and the nationalization program.

The SEI has not provided an official statement, except for the comment by Secretary Jose Rubens Doria Porto that technical studies are being conducted "in accordance with the criteria clearly specified in article 12." Silence also reigns on the part of the firms involved in the SEI decision (Ericsson and Siemens), obviously so as not to fuel political debates similar to those which occurred during evaluation of the GSI (Gerdau Informatics Services) case, which has also yet to receive a response. No date has been set for a decision by the government agency. SEI's claim is that these technical studies may take any amount of time, depending on the case to be analyzed. There is, then, no way of knowing when the two firms might be able to receive a decision on their proposals.

Letters of Intent

The letters of intent sent by Ericsson and Siemens (EQUITEL) discussed the composition of the new firms, beginning with the already existing subsidiaries. In the case of Ericsson, the actual composition of shareholders is the following: Matel S.A., formed by Bradesco and Monteiro Aranha, holds 18 percent of the shares, with 23 percent held by the public and 59 percent by Ericsson's Swedish branch. It is thus in violation of the Informatics Law.

Matel Tecnologia (MATEC), the firm that would be created, would have 18 percent of its capital held by Matel, 31.9 percent by the Monteiro Aranha Group, 20 percent by the public, 20 percent by Ericsson Sweden, and 10 percent by Ericsson Brazil. Seventy percent of the shares would then be in Brazilian hands, as the law requires.

Equitel would give rise to a new Equitel, with Hering holding 50 percent of the shares, Mangles 20 percent, and the remaining 30 percent held by Siemens. It would then also be within the limit required by article 12 of the Law. Concurrently, 17 percent of Equitel is owned by Hering, and 83 percent by Siemens.

Matec would manufacture KS, PABX and other products destined for export. In truth, apart from the percentages of shares controlled by the above mentioned firms, there would be only one change: the activities of Ericsson itself in Brazil. The new Equitel would have digital technology for KS, PABX, telecopiers and data reception terminals.

With regard to shareholder composition, the only difference, apart from the percentage of shares held by Siemens and Hering, would be the entry of another partner, Mangels. These reorganization requests will be added, at the minimum, to that of GSI, which helped stimulate the discussion of Brazilian exports to the United States. It is an especially delicate moment, which perhaps also contributes to the silence on the matter, even though the enterprises involved are not American--Siemens is German and Ericsson Swedish.

13026/12851
CSO: 3699/28

BRAZILIAN COMPUTERS MAY BE SOLD TO CUBA

Rio de Janeiro O GLOBO in Portuguese 2 Nov 86 p 49

[Text] With the reestablishment of diplomatic relations between Cuba and Brazil, a series of negotiations has begun to unfold between the two countries. Still tentatively but persistently, the informatics sector is arousing a great deal of interest among the Cubans. In August of last year, a director of the National Institute for Automated Systems and Computer Technology participated in a computer conference in Rio, and began to take official measures to become better acquainted with information policy in Brazil.

Last week, another step was taken to bring the two countries closer together in this area, with the arrival of Marcel Andino Zayas, Chief of the Department of Scientific Research at the Jose Antonio Echeverria Higher Politechnic Institute--the major center for university studies in Cuba, which brings together 15 thousand students in 23 courses of specialization.

Emphasizing that his visit was not meant to include official negotiations, but rather to announce that a conference on the use of computers in architecture and engineering is to be held in Havana in January of next year, Zayas revealed, however, that Cuba wishes to become better acquainted with Brazil's achievements in the field.

"In Cuba, the advanced state of Brazil's informatics sector is not well known due to lack of information. We know little because we only have access to the information through certain articles that appear in the newspapers," said Zayas.

Cuba has ambitious plans to reverse its backwardness--computers came to be used more intensively in certain fields at the beginning of the 1970s--and for that reason the country has now opted for the strategy of promoting the use of computers among young students.

"The government plan has established that all students entering their first year at the Institute, beginning with the current academic year, must acquire at least 450 hours of computer time during their 5 years of study, in order to be able to effectively operate the computers being used at their places of employment after graduation."

According to Zayas, by the mid-1960s there were one or two computers in the country, the use of which began to be more widespread in the 1970s, when transport of the sugar crop began to be organized by computer and more universal use was widely predicted.

"But because of the blockage to which we have been subjected, we have not been able to count on much help. We have begun to design and construct a small computer in our country. Around 1970, the first prototype of a computer designed by a university group was produced, with support from the government. During the 1970s, this model was copied hundreds of times, and the equipment was used in economic and administrative management."

At the beginning of the 1980s, Cuba increased its purchases of computers imported from socialist countries, machines assembled according to the distribution of labor in each country.

In Cuba there is no such thing as a computer made in the Soviet Union, Poland or Czechoslovakia, but rather one made in the Socialist Bloc.

13026/7051
CSO: 3699/29

- END -